



# 91HS8, 91HSE8 OPERATOR'S MANUAL ADDENDUM

TO THE DAS 9100 SERIES OPERATOR'S MANUAL

(PART NUMBER 070-3624-00, 01, AND UP)

This Tektronix Manual Addendum supports the following products:

91HS8 Data Acquisition Module

91HSE8 Data Acquisition Module

This addendum is designed to be inserted into *DAS 9100 Series Operator's Manuals*. The 062-5847-09 manual set is a package consisting of loose leaf binders with manuals and addenda. Each manual and addendum in the set has its own part number starting with the prefix 070. You can find your manual part number in the bottom left corner of the manual title page. (Note: Some manuals may already have this addendum inserted in the backs of their binders. Check your manual to see if this addendum is a duplicate.)

This addendum contains operator's information specific to the 91HS8 and 91HSE8 Data Acquisition Modules. It adds information to the *DAS 9100 Series Operator's Manual*; it does not replace information.

Refer to the *DAS 9100 Series Operator's Manual* for information on other products, including mainframes, instrument modules, probes, and options.

**How To Use This Addendum.** This addendum is organized similarly to the *DAS 9100 Series Operator's Manual*. Information within the addendum corresponds to sections within the operator's manual.

This addendum affects only some of the operator's manual sections; it does not affect all of them.

Note: You can order extra operator's manual binders by requesting P/N 016-0778-00.

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## SAFETY SUMMARY

The general information in this summary is for both operator and service personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

### TERMS IN THIS MANUAL

**CAUTION** statements identify conditions or practices that could result in damage to the equipment or other property.

**WARNING** statements identify conditions or practices that could result in personal injury or loss of life.

### TERMS AS MARKED ON EQUIPMENT

**CAUTION** indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

**DANGER** indicates a personal injury hazard immediately accessible as one reads the marking.

### SYMBOLS IN THIS MANUAL

 This symbol indicates where applicable cautionary or other information is to be found.

### SYMBOLS AS MARKED ON EQUIPMENT

 **DANGER** — High voltage.

 Protective ground (earth) terminal.

 **ATTENTION** — refer to manual.

### POWER SOURCE

This product is intended to operate from a power source that does not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

## **GROUNDING THE PRODUCT**

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective-ground connection by way of the grounding conductor in the power cord is essential for safe operation.

## **DANGER ARISING FROM LOSS OF GROUND**

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulated) can render an electric shock.

## **USE THE PROPER POWER CORD**

Use only the power cord and connector specified for your product. Use only a power cord that is in good condition.

## **USE THE PROPER FUSE**

To avoid fire hazard, use only the fuse of correct type, voltage rating and current rating as specified in the parts list in the *DAS 9100 Series Service Manual*.

Refer fuse replacement to qualified service personnel.

## **DO NOT OPERATE IN EXPLOSIVE ATMOSPHERES**

To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.

## **DO NOT OPERATE WITHOUT COVERS**

To avoid personal injury, do not operate this product without covers or panels installed.

# SERVICE SAFETY SUMMARY

## FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the Operator's Safety Summary

Appendix B of this manual contains instructions for updating the DAS firmware, and installing 91HS8 and 91HSE8 modules. These instructions should only be used by a qualified service technician. Observe the following precautions when performing any installation procedure.

### **DO NOT SERVICE ALONE**

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

### **REMOVE LOOSE OBJECTS**

During disassembly or installation procedures, screws or other small objects may fall to the bottom of the mainframe or the 91HS8 cabinet. To avoid shorting out the power supply, do not power up the instrument until such objects have been removed.

### **STATIC PRECAUTIONS**



*Static discharge can damage any semiconductor in this instrument.*

Observe the following precautions to avoid damage:

- Minimize handling of static-sensitive components.
- Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive components or assemblies.
- Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies should be performed only in a static-free work station by qualified service personnel.
- Nothing capable of generating or holding a static charge should be allowed on the work station surface.
- Keep the component leads shorted together whenever possible.
- Pick up components by the body, never by the leads.
- Do not slide the components over any surface.
- Avoid handling components in areas that have a floor or work-surface covering capable of generating a static charge.

### **NOTE**

*Damage to electrical components may not be immediately apparent. Always follow the precautionary measures previously listed when handling static-sensitive components.*



# GENERAL INFORMATION

## DESCRIPTION

The 91HS8 and 91HSE8 are eight-channel data acquisition modules compatible with DAS 9100 Series Logic Analyzers. Both units are capable of 2 GHz asynchronous sampling rates. Both the 91HS8 and 91HSE8 consist of an interface board that plugs into the DAS 9100 module compartment, and a separate cabinet containing an acquisition board, a memory board, and a power supply. Nine single-channel probes are permanently attached to the back of the acquisition module cabinet. Eight of the probes are for data acquisition and the ninth acquires an external trigger/arms signal.

The 91HS8 and 91HSE8 modules are functionally identical, the difference being the interface board supplied with each module. The 91HS8 is supplied with a master interface board containing circuitry to align clocks between several 91HS8/91HSE8 modules. This interface board occupies the space for two DAS module slots because of a heat sink attached to the back of the board; the circuit board only makes contact with one slot. Refer to the *Operating Instructions* section of this addendum.

The 91HSE8 is supplied with a standard interface board (without the extra clock circuitry) which requires only one DAS module slot.

For eight channels of data acquisition at 2 GHz, you can use either a 91HS8 or a 91HSE8; they operate identically. For 16 channels or more, one module must be a 91HS8 (to synchronize multiple clocks). Additional modules must be 91HSE8s.

Up to four 91HS8/91HSE8 modules can be used simultaneously, providing 32 data acquisition channels at 2 GHz.

### Trigger Source

91HS8/91HSE8 modules provide two 8-bit-wide word recognizers and one timer as trigger event resources. Multiple 91HS8/91HSE8 configurations require you to designate one module's word recognizers as the trigger source for all modules. Adding additional 91HSE8 modules does not increase the width of the word recognizers; the maximum width is 8 channels.

### 91HS8/91HSE8 Nomenclature

Since the 91HS8 and 91HSE8 modules are identical from the user's point of view, all menus refer simply to the 91HS8. Except for installation descriptions, the text in this manual also refers to the 91HS8 when describing both 91HS8 and 91HSE8 modules.

## MODES OF OPERATION

Each 91HS8 module provides eight incoming data channels supplied by individual single-channel probes. Up to four 91HS8 modules can be installed in the DAS to increase data width to 32 channels. Special deskew procedures are provided to correct for propagation differences between data channels. Deskewing ensures minimum channel-to-channel skew. Refer to the *Operating Instructions* section of this manual for the calibration and deskew procedures.

91HS8 modules acquire data using the DAS internal clock at intervals ranging from 5 ms to 500 ps. The maximum memory depth available is 8000 words.

Glitches can be detected and stored on all eight channels at sampling intervals (clocks)  $\geq 5$  ns. If glitch detection is enabled, memory depth is reduced from 8000 to 4000 words.

91HS8 modules have two independent word recognizers and a timeout function. The word recognizers and timeout provide two levels of sequential trigger and a reset function. Additional trigger features include word duration filters, edge or level triggering, glitch triggering, and word (true or false) recognition. In addition, an external trigger-enable probe can be used to arm the 91HS8 from an external source.

Multiple 91HS8 configurations use one of the 91HS8's word recognizers and timer to trigger all of the modules. Any

91HS8 can be selected as the trigger source. Word recognizer width is not increased when additional modules are installed.

Data can be displayed in either the State Table or Timing Diagram formats.

The following acquisition modes are available:

**91HS8 ONLY Mode.** 91HS8 modules operating in this mode acquire data independently of any other module installed in the DAS. When this mode is selected, only 91HS8 modules will acquire data when you press the START key.

**91A32 ARMS 91HS8 Mode.** This mode lets you operate the 91HS8 in conjunction with the 91A32 Data Acquisition Module. ARMS mode is especially useful for viewing the interaction of slower system components with high-speed circuitry.

In this mode, both 91HS8 and 91A32 modules start simultaneously and operate on independent timebases. When the 91A32 triggers, it arms the 91HS8 to begin searching for its trigger.

In 91A32 ARMS 91HS8 mode, you will make all 91HS8 trigger selections while in 91HS8 ONLY mode, and then select 91A32 ARMS 91HS8 mode to enter the 91A32's trigger selections and start the acquisition.

After making a 91A32 ARMS 91HS8 mode acquisition, the Timing Diagram menu will display the 91A32 sequence number corresponding to where the 91HS8 triggered.

This trigger point correlation can only be determined when data stored by the two sets of modules overlaps appropriately in time. That is, the 91HS8 trigger must occur before the 91A32 stops storing data. (Note that a time-aligned display of slow {91A32} and fast {91HS8} data is not provided.)

## STANDARD AND OPTIONAL ACCESSORIES

### 91HS8/91HSE8 DATA ACQUISITION MODULES

The 91HS8/91HSE8 Data Acquisition Module consists of:

- 91HS8 cabinet
- 9 permanently-attached probes
- Power cord
- Interface board (Master version for 91HS8, Standard version for 91HSE8)
- Interconnect cable (connects 91HS8 cabinet to interface board in DAS mainframe)
- Probe cable marker clips, 1 each of nine different colors
- V1.11 to V1.13 DAS firmware upgrade kit

The DAS 9100 mainframe must have firmware version V1.13 or higher to operate the 91HS8 or 91HSE8. A kit to upgrade the DAS firmware from V1.11 to V1.13 may be included in your accessories bag. Contact your Tektronix representative if you need to order a firmware upgrade kit, or if you need assistance making the upgrade. *Appendix B* of this manual contains the procedure for installing this upgrade.

One of three clock cable kits is supplied with each module. The clock cables are only used in multiple 91HS8/91HSE8 configurations. The number of the kit specific to each 91HS8/91HSE8 module is located on the power supply cover inside the 91HS8 cabinet. Use this number if you need to order new cables.

Kit Number	Delay	Cable Length	Cable P/N
198-5543-00	3.5 ns	27 inches	174-0173-00
198-5541-00	4.0 ns	31 inches	174-0156-00
198-5542-00	4.5 ns	35 inches	174-0157-00

### Additional 91HSE8 Standard Accessories

- 1 175-6425-00 Trigger cable (used only in multiple 91HS8 configurations)

### Optional Accessories

There are no optional accessories for the 91HS8 module.

### 91HS8 and 91HSE8 Standard Accessories

- |    |             |   |
|----|-------------|---|
| 9  | 196-3047-00 | Probe Lead Sets                                 |
| 20 | 013-0217-00 | Probe Grabber Tips                              |
| 1  | 070-5768-02 | <i>91HS8, 91HSE8 Operator's Manual Addendum</i> |

# SPECIFICATIONS

**Table 1**  
**91HS8 AND 91HSE8 ELECTRICAL SPECIFICATIONS**

Characteristics	Performance Requirement	Supplemental Information
Safety General	Complies with the requirements of UL 1244, CSA556B, and IEC 348.	
Power		
Line Voltage Ranges		
115 Vac	90 to 132 Vac	
230 Vac	180 to 250 Vac	
Line Frequency Range	48 to 63 Hz	
Power	400 VA Max	
Acquisition Memory Depth	8000 words	Can store 8000 words of data only, or 4000 words of data and 4000 words of glitch.
Acquisition Memory Width	8 channels	Up to 4 91HS8/91HSE8 modules can be combined to provide up to 32 channels of acquisition.
Trigger		
Trigger Source	In multiple 91HS8/91HSE8 systems, any one of the modules can be selected as the trigger source for all the modules.	
Trigger Selections	<p>Trigger on:</p> <ul style="list-style-type: none"> <li>event A</li> <li>event A or event B</li> <li>event A followed by event B</li> <li>event A followed by event B, reset on timeout</li> <li>event A followed by timeout, reset on event B</li> </ul>	Trigger can be externally armed.
Word Recognition	<p>Two events (A and B) Events may be either a data word or a glitch.</p> <p>For each word, operator can select:</p> <ul style="list-style-type: none"> <li>TRUE (level)</li> <li>↑ TRUE (edge)</li> <li>FALSE (level)</li> <li>↓ FALSE (edge)</li> </ul>	
Word Recognizer Width	8 channels of data or glitch	
Bit Specification		
Data	Logic 1, 0, or X (don't care). The eight channels are ANDed together.	
Glitch	1 (enable) or X (disable). The enabled channels are ORed together.	

**Table 1 (Cont.)**  
**91HS8 AND 91HSE8 ELECTRICAL SPECIFICATIONS**

Characteristics	Performance Requirement	Supplemental Information
Timeout Event Timer 500 ps sampling interval	Selectable from 16 to 32,760 sampling intervals in 8-sample increments	
1 ns sampling interval	Selectable from 8 to 32,760 sampling intervals in 4-sample increments.	
$\geq 2$ ns sampling intervals	Selectable from 4 to 32,760 sampling intervals in 2-sample increments.	
Minimum Sampling Interval Minimum Detectable Pulse Width (clock = 500 ps)	500 ps 1.5 ns * (see note)	* Note: To meet this specification, signals at the probe tips must have a $dV/dt \geq 1$ V/ns through the 100 mV window centered on $V_{th}$ . If $dV/dt < 1$ V/ns, add T to the specification: $T = .050(dt/dV - 1)$ ns ( $dt/dV = \text{ns/V}$ ).
Channel-to-Channel Resolution (clock = 500 ps)		
Within one module	1.0 ns * (see note)	Data edges which are $\geq 1$ ns apart at the probe tip will always be displayed in correct sequence and never coincident (at full display magnification).
Between any two modules in a multiple 91HS8/91HSE8 configuration	2.0 ns * (see note)	
Sampling Intervals (clock)	Selectable: 500ps, 1ns, 2ns, 5ns, 10ns, 20ns, 50ns, 100ns, 200ns, 500ns, 1 $\mu$ s, 2 $\mu$ s, 5 $\mu$ s, 10 $\mu$ s, 20 $\mu$ s, 50 $\mu$ s, 100 $\mu$ s, 200 $\mu$ s, 500 $\mu$ s, 1ms, 2ms, 5ms	
Timebase Accuracy	$\pm 0.1\%$	500 MHz and 200 MHz oscillators derive all sampling intervals.
Minimum Detectable Glitch Width	1.5 ns	Glitch detection available only for sampling intervals $\geq 5$ ns.
Minimum Data Amplitude	500 mV peak to peak	
Threshold Reference Voltage ( $V_{th}$ ) Fixed (TTL)	Screen displays +1.4 V	
Variable (VAR)	Screen displays -2.5 V to 5.0 V in 50 mV steps.	
Accuracy	$\pm 25$ mV $\pm 1.5\%$ of menu-selected value	

**Table 1 (Cont.)**  
**91HS8 AND 91HSE8 ELECTRICAL SPECIFICATIONS**

Characteristics	Performance Requirement	Supplemental Information
Word Recognition 500 ps and 1 ns sampling interval	Word must be present for 1.5 ns to guarantee recognition.	
≥ 2 ns sampling intervals	Word must be present for 2 sampling intervals + 0.5 ns to guarantee word recognition.	
Word Duration Filter		
500 ps sampling interval	OFF, 8, 16, 24, or 32 sampling intervals	
1 ns sampling interval	OFF, 4, 8, 12, or 16 sampling intervals	
≥ 2 ns sampling interval	OFF 4, 6, or 8 sampling intervals	
ARMS Mode Characteristics 91A32 ARMS 91HS8	The 91HS8 will be armed within 10 91A32 clock cycles after occurrence of 91A32 trigger.	
Probe Specifications		
Input Capacitance	≤1 pF	
Input Resistance	10.6 K Ω ± 5%	
Input Voltage Range (signal or reference)	–5 V to +8 V	
Differential Input Voltage Range	± 5 V	
EXT TRIG/ARM Probe Input Delay (Sampling Interval = 500 ps or 1 ns)	The 91HS8 trigger will see data (at the data probe tips) starting 24 ns before the arms signal is asserted (at the tip of the EXT TRIG/ARM probe).	Because there are fewer stages in the EXT TRIG/ARM signal path, some data is captured before the arms signal is asserted.
Delay (Sampling Interval ≥ 2 ns)	The 91HS8 trigger will see data (at the data probe tips) starting 12 sampling intervals before the ARMS signal is asserted (at the tip of the EXT TRIG/ARMS probe).	See preceding column entry.
Polarity	Selectable 1 (above $V_{th}$ ) or 0 (below $V_{th}$ )	
Minimum Amplitude	500 mV p-p	
Threshold Voltage ( $V_{th}$ )		
Fixed (TTL)	Screen displays +1.4 V	
Variable (VAR)	Screen displays –2.5 V to +5.0 V in 50 mV steps	
Accuracy	±125 mV ± 1.5% of menu-selected value	

**Table 1 (Cont.)**  
**91HS8 AND 91HSE8 ELECTRICAL SPECIFICATIONS**

Characteristics	Performance Requirement	Supplemental Information
Trigger Position	GLITCHES = OFF: Begin = 255 Center = 3999 End = 7743  GLITCHES = ON: Begin = 255 Center = 1999 End = 3743	
Trigger Position Delay	Selectable from 80 to 32,760 sampling intervals after trigger in 8-sample increments.	

**Table 2**  
**91HS8 AND 91HSE8 ENVIRONMENTAL SPECIFICATIONS**

Characteristics	Description
Temperature	
Maximum Operating	35°C
Minimum Operating	10°C
Non-operating	–55 to +75°C
Humidity	90% to 95% relative humidity (35°C operating; 60°C non-operating)
Altitude	
Operating	4.5 km (15,000 ft.)
Non-operating	15 km (50,000 ft.)
Electromagnetic Interference	Meets FCC part 15, sup-part J, Class A, without probes. Meets VDE 0871, Class B, without probes.

**Table 3**  
**91HS8 AND 91HSE8 PHYSICAL SPECIFICATIONS**

Characteristics	Description
Weight	
91HS8 cabinet only (without cables or probes)	11.795 kg. (25 lbs. 6 oz.)
91HS8 cabinet with cables, probes, and interface board and manual	12.56 kg. (27 lbs. 11 oz.)
Probe cable length	1.44 m (56.5 in.)
Interconnect cable length	2.03 m (80 in.)
Dimensions of the 91HS8 cabinet	
Length	59 cm (23 3/8 in.)
Width	43 cm (16 3/4 in.)
Height	10 cm (4 1/8 in.)

# OPERATING INSTRUCTIONS

The following paragraphs describe the installation requirements for the 91HS8 and 91HSE8 modules. They also describe operator's checkout procedures and module deskew operations.

**Repackaging Information.** All DAS 9100 Series products are shipped in specially designed transportation packaging. If you need to ship a product, use its original packaging. If the original packaging is no longer fit for use, contact your nearest Tektronix Field Office and obtain new DAS packaging.

If you need to ship any part of your 91HS8/91HSE8 system to a Tektronix Service Center, always include all components of the system. That is, always include your 91HS8 cabinet and interface board, the DAS mainframe, and any probes, cables, and gripper leads.

When you ship a product to a Tektronix Service Center, be sure to attach an identifying tag to the product (inside the packaging). On this tag include: your name, the name of your company, the name and serial number of the enclosed product, and a description of the service requested.

## MODULE INSTALLATION

91HS8 modules must be installed by a qualified service technician. Appendix B of this addendum contains the module installation procedure.

## POWER REQUIREMENTS

All DAS 9100 Series mainframes and 91HS8/91HSE8 Module cabinets operate from a nominal 115 or 230 V, 50 to 60 Hz, single-phase power source. Before connecting either the mainframe or the 91HS8/91HSE8 cabinet to a power source, you should verify that the line-voltage indicator shows the correct voltage range.

The line-voltage indicator for the DAS 9100 Series mainframe is located on the lower-right portion of the back panel. Refer to the *DAS 9100 Series Logic Analyzer Operator's Manual* if you need more information.

The line-voltage indicator for the 91HS8/91HSE8 cabinet is located on the left side of the cabinet's back panel. A black

hex-head screw will indicate that the cabinet is set for either 115 or 230 V operation.



*The position of the back-panel screw is only an indicator of the voltage range setting; changing the position of this screw does not change the power supply's voltage range.*

The 91HS8/91HSE8 cabinet voltage range switch is located inside the cabinet and should only be changed by a qualified service technician. Refer to Appendix B of this manual.

## FUSES

The fuse for the DAS mainframe is located on the back panel near the power cord. Refer to the *DAS 9100 Series Logic Analyzer Operator's Manual* for information concerning this fuse.

The fuse for the 91HS8 cabinet is located on the power supply inside the cabinet. This fuse is a fast-blow type rated at 5 amps for 120 volts, and 2.5 amps for 230 volts. Refer a qualified service technician to Appendix B of this manual for the replacement procedure.

## POWER CORDS

All DAS mainframes and 91HS8/91HSE8 cabinets come with a 3-wire power cord with a 3-contact plug for connection to the power source and to protective ground. The plug protective-ground contact connects to the accessible metal parts of the instrument through the power cord protective grounding conductor. For protection against electrical shock, insert this plug into a power source socket that has a securely grounded protective-ground contact.

**WARNING**

*Hazardous voltages may be present on the exposed metal surfaces of the mainframe if the power source socket's protective ground connection is not securely grounded.*

## CIRCUIT-UNDER-TEST SQUARE-PIN PLACEMENT

Each 91HS8/91HSE8 probe consists of a signal line and a reference line. Both must be connected to the circuit under test for this probe to acquire data. (A label on the probe's flex circuit shows which line is signal and which is reference.)

You can use either of two methods to connect 91HS8/91HSE8 probes to the circuit under test: 1) Use grabber tips (provided) to connect the probe end to the circuit under test. Each grabber tip provides two square pins which plug into the probe end (probelet), and two spring-loaded clips which attach to your circuit. 2) Connect the probe ends directly to square pins mounted on the target circuit board.

**NOTE**

*To prevent the weight of the cables from straining the square pins and probelet connectors, we recommend that you secure the probe cables to your workbench near the circuit-under-test.*

If you are connecting probes directly to square pins, you must make sure that the square pins are properly spaced in

The 91HS8/91HSE8 cabinet power cord attaches to the cabinet's back panel.

91HS8/91HSE8 modules are shipped with a North American 120 V/60 Hz 15 AMP power cord unless otherwise ordered. Other power cords that can be used with the cabinet are shown in the *Operating Instructions* section of the *DAS 9100 Series Operator's Addendum*. Only North American 120 V/60 Hz and 240 V/60 Hz power cords are Canadian Standards Association approved. For further information about available power cords, contact your Tektronix representative.

order to provide a good electrical contact, and to allow sufficient air circulation to cool the hybrid circuit in the probe tip.

91HS8/91HSE8 probelets are designed to slip over .025 inch square pins on your circuit board. The square pins must be on 0.10 inch centers nominal (see Figure 1). The square pins must be at least .228 inches long with tapered ends. Use gold-plated pins to prevent corrosion within the podlet connectors.

Figure 1 shows the minimum square-pin spacing as viewed looking down on a circuit board. Figure 2 shows the minimum spacing for right-angle square pins as viewed from the side; spacing between pairs of square pins should be the same as in Figure 1.

**NOTE**

*Square-pin spacing in figures 1 and 2 assumes ambient temperatures  $\leq 40^{\circ}\text{C}$ . If your operating temperatures exceed  $40^{\circ}\text{C}$ , increase the spacing between square pins, or use a fan to cool the hybrid circuit in the probelets.*

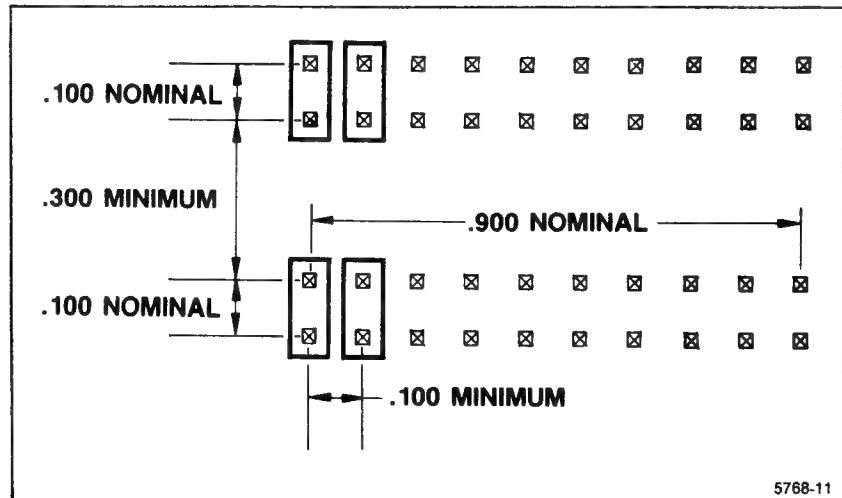
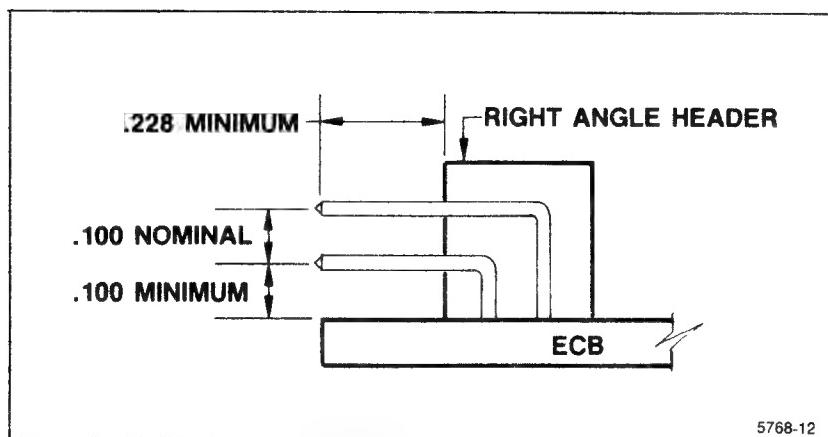


Figure 1. Minimal square pin spacing for 91HS8 probelets.



**Figure 2. Minimal right-angle square pin spacing for 91HS8 probelets.**

## FIRMWARE COMPATIBILITY

Your DAS 9100 mainframe is equipped with one of several possible firmware versions. 91HS8/91HSE8 modules can only operate in DAS 9100 mainframes equipped with firmware versions 1.13 or higher.

91HS8/91HSE8 modules also have their own firmware versions. All 91HS8/91HSE8s installed in a DAS 9100 must have the same module firmware version.

**To check the firmware version number:** After you have installed the 91HS8/91HSE8 modules, power up the DAS 9100. The first menu to appear is the Power-up menu. The DAS 9100 firmware version number will be displayed in the upper right corner of the screen. The module firmware ver-

sion for each 91HS8/91HSE8 module will be displayed on the line next to the module's name.

If the DAS 9100 firmware version number is less than V1.13, you must have a qualified service technician replace the firmware EPROM on the controller board. Check the accessories bag to see if a firmware update kit is included. Contact your Tektronix representative if you need to order a firmware update kit. Appendix B of this manual contains the firmware update procedure.

If you have more than one 91HS8/91HSE8 firmware version installed, contact your Tektronix representative to obtain a module firmware update kit.

## CONFIGURATION REQUIREMENTS

91HS8 and 91HSE8 modules can reside in a DAS 9100 mainframe containing the following module types:

- 91A32 Data Acquisition Modules
- 91P16/32 Pattern Generator Modules
- 91S16/32 Pattern Generator Modules
- Option 6 I/O Communication Interface

You must remove all other module types from the DAS when you install 91HS8/91HSE8 modules.

91HS8/91HSE8 modules consist of a cabinet containing the acquisition and memory circuit boards, and a separate interface board that must be installed into the DAS instrument module compartment. The interface card can be installed in any instrument slot powered by an 18 amp or 22 amp +5 V power supply.

Some DAS mainframes are equipped to power only a portion of the instrument module slots. You can determine which module slots are receiving +5 V power by removing the DAS top cover and looking at the holes in the power supply shield (located behind the CRT in the DAS mainframe); if chrome

pins are visible in all three holes, then all DAS module slots are provided with +5 V power. Refer to the decals on the power supply shield to determine which power supply affects which module slots. DO NOT remove the power supply protective shield.

While the 91HS8 and 91HSE8 cabinets are identical, there are two versions of the Interface card. The Standard Interface card, supplied with 91HSE8 modules, occupies only one DAS instrument slot. The Master Interface card, supplied with 91HS8 modules, has a large heat sink attached to the back of the circuit board that causes it to take up space for two circuit boards in the DAS instrument module compartment.

The 91HS8 (with Master Interface card) is required to synchronize timing signals any time there are two or more 91HS8/91HSE8 modules installed in the DAS. If only eight channels of high-speed acquisition are required, you can use either a 91HS8 or a 91HSE8 module. Refer to the following table to determine which acquisition module combination is required in order to give the desired number of high-speed channels, and to determine the number of DAS module slots that combination occupies.

Number of Channels at 2 GHz	Order	Description	Mainframe Slots Required
8	1 91HSE8 -OR- 1 91HS8	HS8 cabinet + Standard Interface card	1
		HS8 cabinet + Master Interface card	2
16	1 91HS8 1 91HSE8	HS8 cabinet + Master Interface card	2
		HS8 cabinet + Standard Interface card	1
24	1 91HS8 2 91HSE8	HS8 cabinet + Master Interface card	2
		HS8 cabinet + Standard Interface cards	2
32	1 91HS8 3 91HSE8	HS8 cabinet + Master Interface card	2
		HS8 cabinet + Standard Interface cards	3

Qualified service technicians should refer to *Appendix B* of this addendum for the installation procedure.

## OPERATOR'S CHECKOUT PROCEDURE

When the DAS is powered up, the name of all installed modules will appear in the Power-up Menu. A PASS or FAIL notation will appear next to each module's name to denote

the results of that module's power-up testing. Table 4 describes the power-up errors for the 91HS8 module and the possible causes for failure.

**Table 4**  
**POWER-UP ERROR CONDITIONS**

Error Condition	Definition
91HS8 Acquisition Module FAIL	<p>The 91HS8 has failed the power-up test. The module will not operate properly.</p> <p>91HS8/91HSE8 modules will fail the power-up test for the following reasons:</p> <ul style="list-style-type: none"> <li>• The 91HS8 cabinet is not receiving power. Check the 91HS8 cabinet's front-panel light and power cord.</li> <li>• All 91HS8 data probes are bad. The 91HS8 will pass diagnostics if one or more data probes are functional.</li> <li>• Probes are connected to a voltage source exceeding the specified probe input levels.</li> <li>• 91HS8 master will fail if any connected 91HSE8 modules fail. Turn off the DAS; disconnect the failed 91HSE8 and power up again.</li> <li>• The 91HS8/91HSE8 module itself has failed. Contact your Tektronix Service Center to arrange for repair.</li> </ul>

## MODULE CALIBRATION AND DESKEWING

The operation of each 91HS8 acquisition probe can be verified by performing a calibration and deskewing procedure. This procedure tests the functionality of each probe and stores a value in memory used to correct for any skew between data channels. The 91HS8 calibration and deskewing procedure should be performed under the following circumstances:

**Power-up.** The deskewing and calibration procedure should be performed whenever the 91HS8 is powered up. The calibration parameters are then saved in memory until the 91HS8 is turned off.

In order to save time, you can also save the calibration parameters on tape by creating an ALL, ACQ SETUP, or DESKEW file after the calibration operation has been performed. The calibration parameters will automatically be re-entered into the system when the DAS is powered up and the

appropriate file is restored. (This approach is only useful if you have not changed your setup or changed room temperatures since creating the data file.)

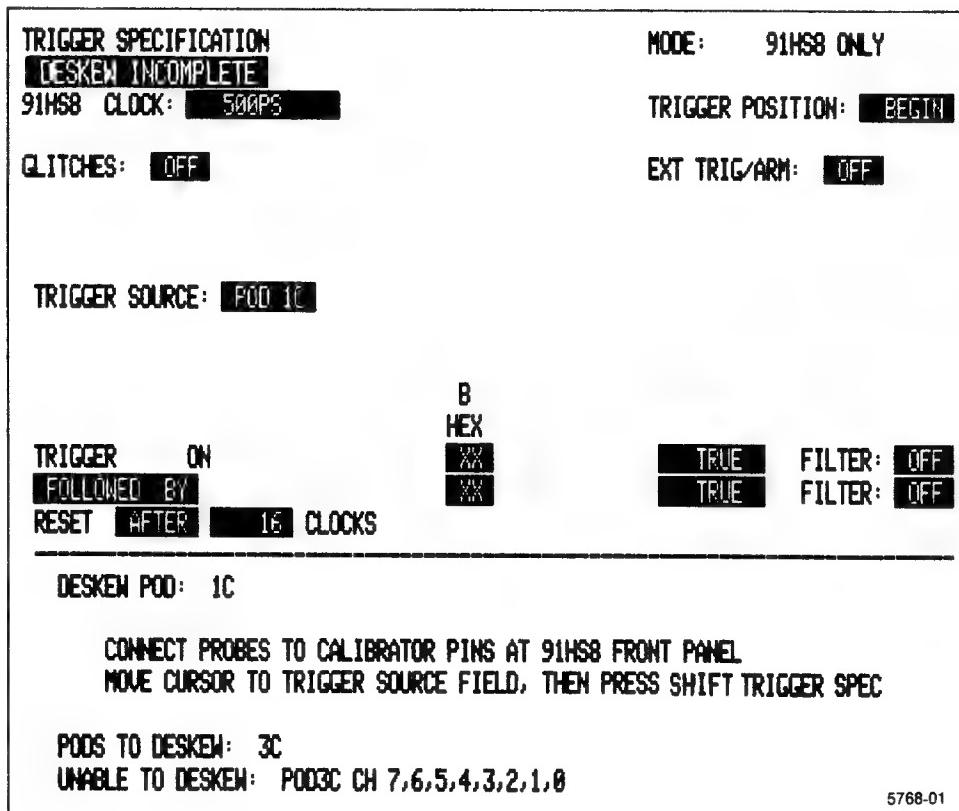
**Probe Connection Changes.** The calibration and deskew procedure should be performed whenever the probe connected to any channel is replaced (by qualified service personnel only). If the calibration parameters have been stored on tape, a new ALL, ACQ SETUP, or DESKEW file should be created. Refer to the *DAS 9100 Series Operator's Manual, Section 10, Input Output Menu*, for instructions on how store acquisition setups on tape.

**Ambient Temperature Change.** To operate properly, the 91HS8 module must have been calibrated at an ambient temperature within 5°C of the current operating temperature.

### Calibration and Deskew Procedure

After the 91HS8 has been powered up, enter the Trigger Specification menu. A message at the top of the display

notifies you that deskewing is necessary. Refer to Figure 3.



**Figure 3. DESKEW INCOMPLETE Trigger Specification Menu.**

Each 91HS8 and 91HSE8 module must be deskewed individually. Use the Trigger Source field (in the Trigger Spec menu) to select which 91HS8 module will be calibrated. Each 91HS8 module is identified by a Probe POD number, #C, where # is the number of the DAS instrument slot containing the 91HS8 interface card. In multiple 91HS8 configurations, each 91HS8 module will have an interface card and a POD designation.

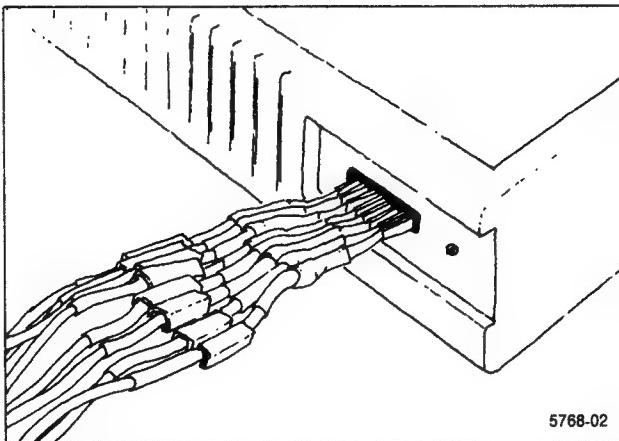
#### Connecting Probes to Calibrator

1. Connect each data probe to the calibrator square pins on the front of its 91HS8 cabinet. Refer to Figure 4. (The Trig/Arms probe should not be connected to the calibrator.) Pins on the top row of the calibrator correspond to the signal pins on the probe tips; the bottom row of calibrator pins correspond to the reference pins on the probes. The calibrator pins are not channel-specific. A label on the probe-tip flex circuit shows which pin is signal and which is reference.
2. When all the data probes are attached, make sure the cursor is positioned in the TRIGGER SOURCE field, and simultaneously press the SHIFT and TRIGGER SPEC keys.

The calibration and deskew procedure will take several minutes to complete. The name of any channel that cannot be calibrated will appear in the UNABLE TO

DESKW list. If a channel fails to deskew, make sure that the probes are correctly connected to the calibrator pins and perform the test again. Inability to deskew a channel indicates a hardware malfunction. Refer service to qualified personnel. However, the 91HS8 module can still be used without connecting the failed channels.

3. For multiple 91HS8 configurations, repeat the above procedure until each module has been deskewed.



**Figure 4. Connecting probes to front-panel calibrator pins.**

## CHANNEL SPECIFICATION MENU

The Channel Specification menu is used to group channels for display purposes and to select input threshold voltages.

For specific information on how to operate the Channel Specification menu, refer to *Channel Specification Menu* in the *DAS 9100 Series Operator's Manual*. The following paragraphs describe only special characteristics of the menu as they pertain to the 91HS8 module.

The PROBE POD designation for an 91HS8 is always "POD #C", where # is the number of the DAS Instrument slot containing the 91HS8 interface card.

In multiple 91HS8/91HSE8 configurations, each 91HS8 module will have a slot number and a POD #C designation.

The following rules apply to the 91HS8 selection in this menu:

1. Each 91HS8 is treated as one probe POD.
2. The channels of each POD can be assigned to several different channel groups.
3. Each group can only have channels from one POD.
4. All groups associated with a POD must have a common threshold voltage. That is, only one threshold voltage per 91HS8 is allowed. In multiple-91HS8 configurations, each 91HS8 module can be assigned a different threshold voltage.



# TRIGGER SPECIFICATION MENU

The 91HS8/91HSE8 module may be used in two modes, as selected by the Trigger Specification menu. They are:

**91HS8 ONLY Mode** which allows acquisition using only the 91HS8 module. Other slower modules in the DAS mainframe do not acquire data.

**91A32 ARMS 91HS8 Mode** which allows acquisition using both 91HS8 and slower 91A32 modules. The word recognition circuitry of the 91HS8 ignores all incoming data until the

trigger conditions of the 91A32 are satisfied. As long as the 91HS8 triggers before the 91A32 module completes its acquisition, a field in the 91A32 Timing Diagram menu will display the approximate sequence number where the 91HS8 triggered. (If the 91HS8 triggers after the A32 completes its acquisition, the field will indicate  $TC > 512$ , meaning the 91HS8 triggered sometime after the last 91A32 acquisition.)

The following paragraphs describe these trigger modes and their parameters.

## 91HS8 ONLY Sub-Menu

Figure 5 illustrates a typical 91HS8 ONLY sub-menu display and its fields. Refer to the numbered callouts in Figure 5 when

reading the following field descriptions. These numbers are intended as visual references, and do not imply sequence of use.

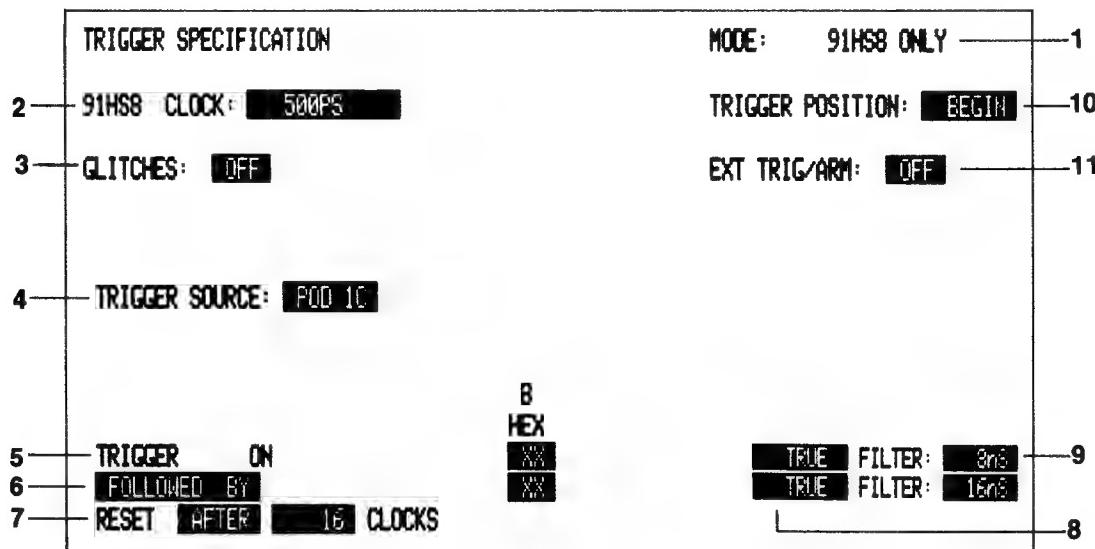


Figure 5. 91HS8 ONLY Trigger Specification Menu.

### (1) MODE Field

The MODE field is used to select between the Trigger Specification menu's available trigger modes. Move the cursor to this field and press the SELECT key to make your selection. The selections are:

91HS8 ONLY  
91A32 ARMS 91HS8

### (2) 91HS8 CLOCK Field

The 91HS8 CLOCK field is used to specify the rate at which incoming data is sampled and stored in memory. The 91HS8 module can be set to acquire data at sampling intervals ranging between 500ps and 5 ms.

To select the clock rate, press the INCR key to increase the interval value; or press the DECR key to decrease the interval value.

The DAS displays increasing or decreasing values in a 1-2-5 sequence between 500 ps and 5 ms.

### (3) GLITCHES Field

This field is used to specify whether the glitch detectors will be enabled. Use the SELECT key to specify either ON or OFF. If ON is selected, the glitch information from the glitch detectors on all 8 channels will be stored in memory, using up half of the acquisition memory (4000 words), thus leaving 4000 words for storage of sampled data.

Note: The GLITCHES field can be turned ON only when the 91HS8 CLOCK field is set to a sampling interval  $\geq 5$  ns.

## (4) TRIGGER SOURCE Field

In a multiple-91HS8 configuration, this field is used to select which 91HS8 module will provide the trigger signal to all modules. The Trigger Specification menu applies only to that selected module. This field is also used in the calibration procedure (see *Module Calibration and Deskeweing* in the *Operating Information* section of this addendum).

In a single 91HS8 configuration, this field will disappear after the calibration procedure has successfully been completed.

## (5) TRIGGER ON Field

This field is used to specify the first word recognizer event in a triggering sequence. Press SELECT to choose from the following options:

**TRIGGER ON [Data Word]** Use the data entry keys to enter the desired word value. Don't care values (X) are entered by using the DON'T CARE key.

The number of channels available in this field, as well as their group format and radix, is determined by the Channel Specification menu. Refer to the description of the Channel Specification menu in the *DAS 9100 Series Operator's Manual* for more information.

**TRIGGER ON GLITCH** Use the data entry keys to enter a 1 (glitch trigger enable) or X (use the DON'T CARE key) for each data acquisition channel available. The enabled glitch channels are OR'ed together so that a glitch on any one of them will satisfy the word recognizer.

Note: This selection can be made only if the GLITCHES field is turned ON.

## (6) Second Event Field

This field is used to specify the second event in a triggering sequence. Press SELECT to choose from the following options:

**[Blank]** This is the default value for this field. No second event is displayed. Only one word recognizer level, specified in the TRIGGER ON field, is needed to trigger the 91HS8 module.

**OR [Word Recognizer Event]** Either one of two word recognizer events will trigger the 91HS8. The first event is specified in the TRIGGER ON line, and the second event is specified in the OR line. Use data entry keys to enter the desired word value.

**OR GLITCH ON [Word Recognizer Event]** Either one of two events will trigger the 91HS8. The first event is a data word or glitch as specified on the TRIGGER ON line, and the

second event is a glitch as specified on this line. Use the data entry keys to enter a 1 (glitch trigger enable) or X (use the DON'T CARE key) for each data acquisition channel available. The enabled glitch channels are OR'ed together so that a glitch on any one of them will satisfy the word recognizer.

Note: This selection can be made only if the GLITCHES field is turned ON.

**FOLLOWED BY [Data Word]** After the first (TRIGGER ON) event is found, a second word recognizer event as specified on this line will trigger the 91HS8. Use the data entry keys to enter the desired word value.

**FOLLOWED BY GLITCH ON [Word Recognizer Event]**

After the first (TRIGGER ON) event is found, a glitch as specified on this line will trigger the 91HS8. Use the data entry keys to enter a 1 (glitch trigger enable) or X (use the DON'T CARE key) for each data acquisition channel available. The enabled glitch channels are OR'ed together so that a glitch on any one of them satisfies the word recognizer.

Note: This selection can be made only if the GLITCHES field is turned ON.

**FOLLOWED BY [Timeout Event]** A programmable timeout-event timer starts when the first (TRIGGER ON) event occurs. When this timer reaches its terminal count, the 91HS8 will trigger.

Use the data entry keys to specify a value ranging between 4 and 32,760 clocks (sampling intervals) long. Exceptions: for 1ns clock the range is 8-32,760; for 500ps clock the range is 16-32,760.

Allowable values occur in increments of 2 sampling intervals. Exceptions: for 1ns clock, allowable values occur in increments of 4; for 500ps clock, allowable values occur in increments of 8. If the value you enter falls between two allowable values, it will be automatically decremented to the next allowable value when you exit the field.

## (7) RESET Field

This field allows a third event to reset the trigger sequence if a trigger has not yet occurred. That is, the word recognizer will start looking for the first (TRIGGER ON) event again. Press the SELECT key to choose from the following options:

**OFF** This is the default value for this field. No third event is displayed. No reset action occurs.

**RESET AFTER [Timeout Event]** A programmable timeout-event timer starts when the first (TRIGGER ON) event occurs. If this timer reaches terminal count before the second word recognizer event is found, the 91HS8 starts looking for the first TRIGGER ON event again.

Use the data entry keys to specify a value ranging between 4 and 32,760 (sampling intervals). Exceptions: for 1ns clock the range is 8-32,760; for 500ps clock the range is 16-32,760.

Allowable values occur in increments of 2 sampling intervals. Exceptions: for 1ns clock, allowable values occur in increments of 4; for 500ps clock, allowable values occur in increments of 8. If the value you enter falls between two allowable values, it will be automatically decremented to the next allowable value when the field is exited.

Note: This selection can only be used if a FOLLOWED BY [Data Word] selection is made in the previous line.

**RESET ON [Data Word]** A programmable timeout event timer starts when the first (TRIGGER ON) event occurs. If the word recognizer event specified on this line (RESET ON) is found before the timer reaches terminal count, the trigger sequence will be reset. Use the data entry keys to enter the desired word value.

Note: This selection can only be used when a FOLLOWED BY [Timeout Event] selection is made in the previous line.

## (8) TRUE/FALSE Field

One of these fields appears on the same line with every data word event. This field will not appear if Glitches has been selected as the word recognizer event. Press SELECT to choose from one of the following options:

**TRUE** the event will be recognized on the True edge of the word recognizer output; that is, on the transition from False to True. If the word is always True, no event will be recognized.

**FALSE** the event will be recognized on the False edge of the word recognizer output; that is, on the transition from True to False. If the word is always False, no event will be recognized.

**TRUE** the event will be recognized on the True level of the word recognizer output. No edge is required.

**FALSE** the event will be recognized on the False level of the word recognizer output. No edge is required.

## (9) FILTER Field

One of these fields appears on the same line with every True data word event (level or edge). The word duration filters allow the user to require that a word remain asserted for some period of time before it is recognized.

Word duration filter values are dependant on the clock rate you have selected. Use the following table to view which filter values are available for each clock rate.

Sample Rate	Available Selections				
5 ms	off	20 ms	30 ms	40 ms	
2 ms	off	8 ms	12 ms	16 ms	
1 ms	off	4 ms	6 ms	8 ms	
500 µs	off	2 ms	3 ms	4 ms	
200 µs	off	800 µs	1.2 ms	1.6 ms	
100 µs	off	400 µs	600 µs	800 µs	
50 µs	off	200 µs	300 µs	400 µs	
20 µs	off	80 µs	120 µs	160 µs	
10 µs	off	40 µs	60 µs	80 µs	
5 µs	off	20 µs	30 µs	40 µs	
2 µs	off	8 µs	12 µs	16 µs	
1 µs	off	4 µs	6 µs	8 µs	
500 ns	off	2 µs	3 µs	4 µs	
200 ns	off	800 ns	1.2 µs	1.6 µs	
100 ns	off	400 ns	600 ns	800 ns	
50 ns	off	200 ns	300 ns	400 ns	
20 ns	off	80 ns	120 ns	160 ns	
10 ns	off	40 ns	60 ns	80 ns	
5 ns	off	20 ns	30 ns	40 ns	
2 ns	off	8 ns	12 ns	16 ns	
1 ns	off	4 ns	8 ns	12 ns	16 ns
500 ps	off	4 ns	8 ns	12 ns	16 ns

Note that 500 ps and 1 ns clock rates have a 1 ns duration requirement even when the filter is off.

The word duration filters are only available with TRUE or  TRUE events (they are disabled for FALSE or  FALSE events).

## (10) TRIGGER POSITION Field

This field allows you to select your stored-data window relative to the trigger. If you select BEGIN in the TRIGGER position field, most of the data stored by the logic analyzer will have been acquired after the trigger was detected. If you select END, most of the data stored by the logic analyzer will have been acquired before the trigger occurred.

Press SELECT to choose one of the following options:

**BEGIN** The trigger is positioned at sequence number 255, at the beginning of memory. Words 0-254 are data which preceded the trigger word.

**CENTER** The trigger is positioned at the center of memory, at sequence number 3999. Words 0-3998 are data which preceded the trigger word. (If GLITCHES ON is selected, the trigger is positioned at sequence number 1999.)

**END** The trigger is positioned at the end of memory, at sequence number 7743. (If GLITCHES ON is selected, the trigger is positioned at sequence number 3743.)

**DELAY** A new field appears on the screen directly below the TRIGGER POSITION field. Use this field to enter the number of clock cycles you wish to delay the trigger position.

## 91HS8 Operator's Addendum—Trigger Specification Menu

Use the data entry keys to specify a value ranging between 80 and 32,760 sampling intervals long.

Allowable values occur in increments of 8 sample intervals. If the value you enter falls between two allowable values, it will be automatically decremented to the next allowable value when the field is exited.

### (11) EXT TRIG/ARM Field

This field specifies whether the external arming mode for the 91HS8 will be enabled. If enabled, the 91HS8 begins looking for its trigger only after the signal applied to the EXT TRIG/ARM probe is asserted.

Press SELECT to choose from the following options:

**OFF** This is the default value for this field. No external arming is required to trigger the 91HS8.

**1** The 91HS8 trigger is armed when the signal applied to the EXT TRIG/ARM probe is asserted high (above the threshold level). When this option is selected, a threshold selection field appears immediately below (similar to the Channel Specification menu threshold selection).

**0** Same as above, except the external TRIG/ARM signal must be asserted low (below the threshold level).

## 91A32 ARMS 91HS8 Sub-Menu

The 91A32 ARMS 91HS8 Mode sub-menu looks very similar to the 91A32 ONLY sub-menu. When using this operating mode, you will first select the 91HS8 ONLY sub-menu, make the necessary selections pertaining to the 91HS8 modules, then select the 91A32 ARMS 91HS8 sub-menu. Make the

selections pertaining to the 91A32 in the 91A32 ARMS 91HS8 menu, and then press START SYSTEM to start both card types. Figure 6 illustrates the 91A32 ARMS 91HS8 Trigger Specification Menu.

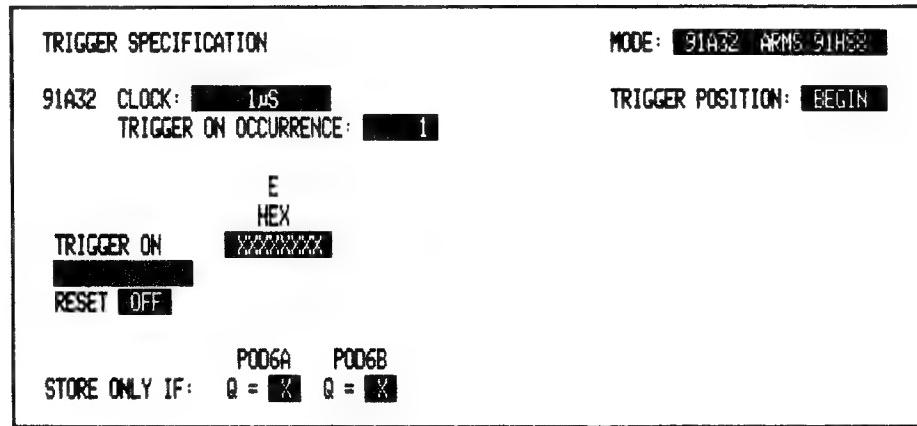


Figure 6. 91A32 ARMS 91HS8 Trigger Specification Menu.

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In 91A32 ARMS 91HS8 mode, the two types of modules act as linked logic analyzers. Both 91HS8 and 91A32 modules start acquisition simultaneously, but their triggers occur separately. The 91A32 trigger must occur first to arm the 91HS8 trigger.

Setup of sub-menus for 91A32 ARMS 91HS8 mode acquisition is identical to the setup for each module's 91HS8 ONLY mode. Therefore, detailed discussion of sub-menus and their setups is not included here. Refer to the appropriate 91HS8 ONLY mode discussions in this addendum for 91HS8 information. Refer to the *DAS 9100 Series Operator's Manual* for 91A32 ONLY mode information.

Since the 91A32 and the 91HS8 use different timebases, there are no restrictions on the clock speeds you can select for the two modules. Both triggers can also be delayed without restrictions.

After a 91A32 ARMS 91HS8 mode acquisition, the Timing Diagram menu will display the 91A32 sequence number corresponding to where the 91HS8 triggered.

This trigger point correlation can only be determined when data stored by the two sets of modules overlaps appropriately in time. That is, the 91HS8 trigger must occur before the 91A32 stops storing data. (Note that a time-aligned display of slow {91A32} and fast {91HS8} data is not provided.)

Use the data entry keys to specify a value ranging between 4 and 32,760 (sampling intervals). Exceptions: for 1ns clock the range is 8-32,760; for 500ps clock the range is 16-32,760.

Allowable values occur in increments of 2 sampling intervals. Exceptions: for 1ns clock, allowable values occur in increments of 4; for 500ps clock, allowable values occur in increments of 8. If the value you enter falls between two allowable values, it will be automatically decremented to the next allowable value when the field is exited.

Note: This selection can only be used if a FOLLOWED BY [Data Word] selection is made in the previous line.

**RESET ON [Data Word]** A programmable timeout event timer starts when the first (TRIGGER ON) event occurs. If the word recognizer event specified on this line (RESET ON) is found before the timer reaches terminal count, the trigger sequence will be reset. Use the data entry keys to enter the desired word value.

Note: This selection can only be used when a FOLLOWED BY [Timeout Event] selection is made in the previous line.

## (8) TRUE/FALSE Field

One of these fields appears on the same line with every data word event. This field will not appear if Glitches has been selected as the word recognizer event. Press SELECT to choose from one of the following options:

**TRUE** the event will be recognized on the True edge of the word recognizer output; that is, on the transition from False to True. If the word is always True, no event will be recognized.

**FALSE** the event will be recognized on the False edge of the word recognizer output; that is, on the transition from True to False. If the word is always False, no event will be recognized.

**TRUE** the event will be recognized on the True level of the word recognizer output. No edge is required.

**FALSE** the event will be recognized on the False level of the word recognizer output. No edge is required.

## (9) FILTER Field

One of these fields appears on the same line with every True data word event (level or edge). The word duration filters allow the user to require that a word remain asserted for some period of time before it is recognized.

Word duration filter values are dependant on the clock rate you have selected. Use the following table to view which filter values are available for each clock rate.

Sample Rate	Available Selections				
5 ms	off	20 ms	30 ms	40 ms	
2 ms	off	8 ms	12 ms	16 ms	
1 ms	off	4 ms	6 ms	8 ms	
500 µs	off	2 ms	3 ms	4 ms	
200 µs	off	800 µs	1.2 ms	1.6 ms	
100 µs	off	400 µs	600 µs	800 µs	
50 µs	off	200 µs	300 µs	400 µs	
20 µs	off	80 µs	120 µs	160 µs	
10 µs	off	40 µs	60 µs	80 µs	
5 µs	off	20 µs	30 µs	40 µs	
2 µs	off	8 µs	12 µs	16 µs	
1 µs	off	4 µs	6 µs	8 µs	
500 ns	off	2 µs	3 µs	4 µs	
200 ns	off	800 ns	1.2 µs	1.6 µs	
100 ns	off	400 ns	600 ns	800 ns	
50 ns	off	200 ns	300 ns	400 ns	
20 ns	off	80 ns	120 ns	160 ns	
10 ns	off	40 ns	60 ns	80 ns	
5 ns	off	20 ns	30 ns	40 ns	
2 ns	off	8 ns	12 ns	16 ns	
1 ns	off	4 ns	8 ns	12 ns	16 ns
500 ps	off	4 ns	8 ns	12 ns	16 ns

Note that 500 ps and 1 ns clock rates have a 1 ns duration requirement even when the filter is off.

The word duration filters are only available with TRUE or  TRUE events (they are disabled for FALSE or  FALSE events).

## (10) TRIGGER POSITION Field

This field allows you to select your stored-data window relative to the trigger. If you select BEGIN in the TRIGGER position field, most of the data stored by the logic analyzer will have been acquired after the trigger was detected. If you select END, most of the data stored by the logic analyzer will have been acquired before the trigger occurred.

Press SELECT to choose one of the following options:

**BEGIN** The trigger is positioned at sequence number 255, at the beginning of memory. Words 0-254 are data which preceded the trigger word.

**CENTER** The trigger is positioned at the center of memory, at sequence number 3999. Words 0-3998 are data which preceded the trigger word. (If GLITCHES ON is selected, the trigger is positioned at sequence number 1999.)

**END** The trigger is positioned at the end of memory, at sequence number 7743. (If GLITCHES ON is selected, the trigger is positioned at sequence number 3743.)

**DELAY** A new field appears on the screen directly below the TRIGGER POSITION field. Use this field to enter the number of clock cycles you wish to delay the trigger position.

# STATE TABLE MENU

For specific information on how to operate the State Table, refer to *State Table Menu* in the *DAS 9100 Series Operator's Manual*. The following paragraphs describe only special display considerations as they apply to 91HS8 data.

## ACQUISITION Display

Two types of State Table displays are possible when 91HS8s are installed in the DAS. If you selected 91HS8 ONLY mode in the Trigger Specification menu, only 91HS8 modules will acquire data, and only 91HS8 data will appear in the State Table menu. If you selected 91A32 ARMS 91HS8 mode in the Trigger menu, both 91A32 and 91HS8 modules

will acquire data, and both 91A32 data and 91HS8 data will be displayed, but not in a time-aligned display.

Whenever 91A32 ARMS 91HS8 mode has been selected, the 91A32 data will be displayed as the first 512 acquisition cycles. A visual "fence" will separate the 91A32 and 91HS8 data at line 512. Refer to Figure 7.

In all other respects, the 91HS8 State Table display operates like the 91A32 ONLY State Table display.

STATE TABLE DISPLAY: ACQUISITION					COMPARE: START SEQ <b>0</b>	
					STOP SEQ <b>511</b>	
TRIG =	01000011	01000011	01000011	01000011	00000000	
SRCH =	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	
SEQ	A	B	C	D	E	
509					00000000	
507					00000000	
508					00000000	
509					00000000	
510					00000000	
511					00000000	
512						
513	11000011	11000011	11000011	11000011		
514	11000011	11000011	11000011	11000011		
515	11000011	11000011	11000011	11000011		
516	11000011	11000011	11000011	11000011		
517	11000011	11000011	11000011	11000011		
518	11000011	11000011	11000011	11000011		
519	01000011	01000011	01000011	01000011		
520	01000011	01000011	01000011	01000011		
521	01000011	01000011	01000011	01000011		

Figure 7. 91A32/91HS8 State Table Display (four 91HS8s and one 91A32 shown).

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# TIMING DIAGRAM MENU

For specific information on how to operate the Timing Diagram, refer to *Timing Diagram Menu*, Section 6, of the *DAS 9100 Series Logic Analyzer Operator's Manual*. The following paragraphs describe only special display considerations related to the 91HS8 module.

## Acquisition Display

There are two different Timing Diagram menus for 91HS8 data. 91HS8 data is always available as a 91HS8 ONLY mode timing display. If you are acquiring data in 91A32

ARMS 91HS8 mode (selected in the Trigger Specification menu), you can display both 91A32 data and 91HS8 data in a combined display.

## 91HS8 ONLY Mode Timing Display

The 91HS8 ONLY mode Timing Diagram menu displays 91HS8 acquisition data in 512-word blocks. You can see which 512-word block is being displayed by setting the MAG (magnification) field to 1, and observing the memory window display. (Memory search functions are limited to the 512 words currently displayed.)

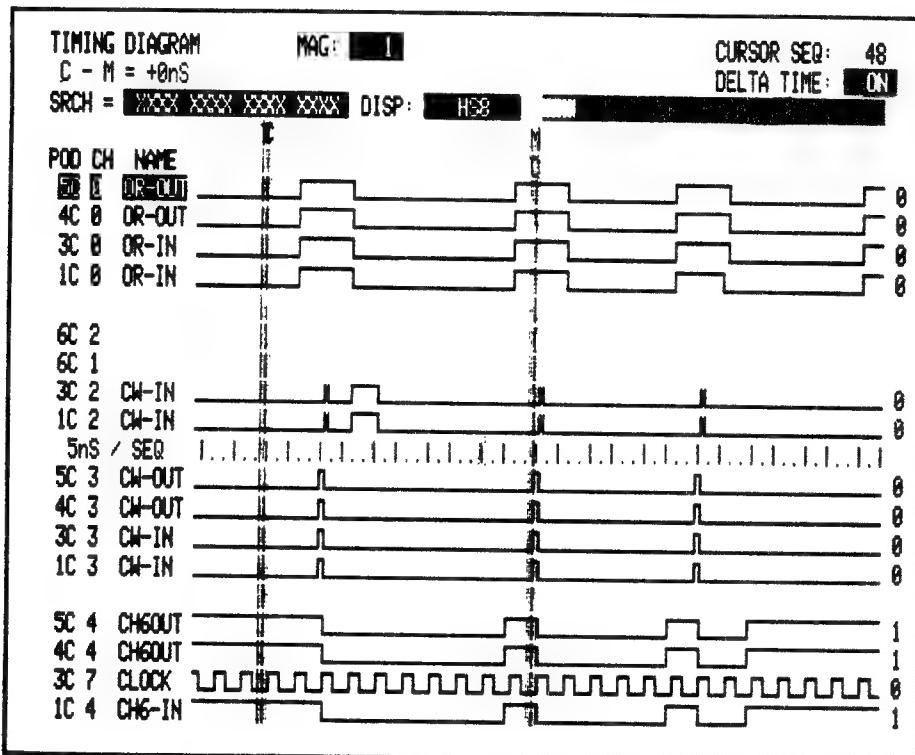


Figure 8. 91HS8 ONLY Mode Timing Diagram.

To move through the rest of the 91HS8 data in memory and view a new block of memory:

Set the MAG field to a value of 1. Then, scroll the data cursor (C) to the right to see data towards the end of memory. (Use the left scroll key to display data toward the beginning of memory.) When the cursor reaches the edge of the screen, the display will be redrawn showing the cursor at the center of the screen and the next 256-byte block of data displayed on the right side of the cursor.

## Glitches Display

The GLITCHES field, located next to the MAG field, is used to control the display of glitch information on the 91HS8 channel traces.

Note: This field only appears if glitch detection was turned on during the last 91HS8 acquisition cycle. (See GLITCHES field in the Trigger Specification menu description.)

To display glitches:

Move the screen cursor to the GLITCHES field. Then, press SELECT to change the value from OFF to ON.

When displayed, the glitches appear as vertical marks within the sampling interval in which they occurred. (It is helpful to increase the magnification of the display.)

## DELTA TIME Field and Screen Graticule

The DELTA TIME field is used to make timing measurements and to display the screen graticule for 91HS8 data.

Move the cursor to the DELTA TIME field and press the SELECT key to enable this feature. When this field is turned ON, a marker line (M) appears at the cursor (C) position. As you scroll the cursor away from the marker, the distance between C and M is computed and displayed near the top left corner of this menu.

When Delta Time is turned on, a graticule appears in the middle row of the timing diagram (91HS8 data only). The scale of the graticule is determined by the sample rate set for your acquisition, and the value of the Magnification field set in this menu. No graticule marks can be displayed when the magnification is set to 1 and the sample rate is set to 500 ps.

The graticule is not linear for all display scales. Pay attention only to the graticule bars; the number of dots between bars and the spacing between bars on the screen have no meaning.

## 91A32 ARMS 91HS8 Mode Timing Display

If you have acquired data in 91A32 ARMS 91HS8 mode, you can choose to display a combination of 91A32 and 91HS8 data, or just 91HS8 data.

To view a combination of 91A32 and 91HS8 data, move the screen cursor to the DISPLAY field and select 91A32 ARMS 91HS8. Refer to Figure 9.

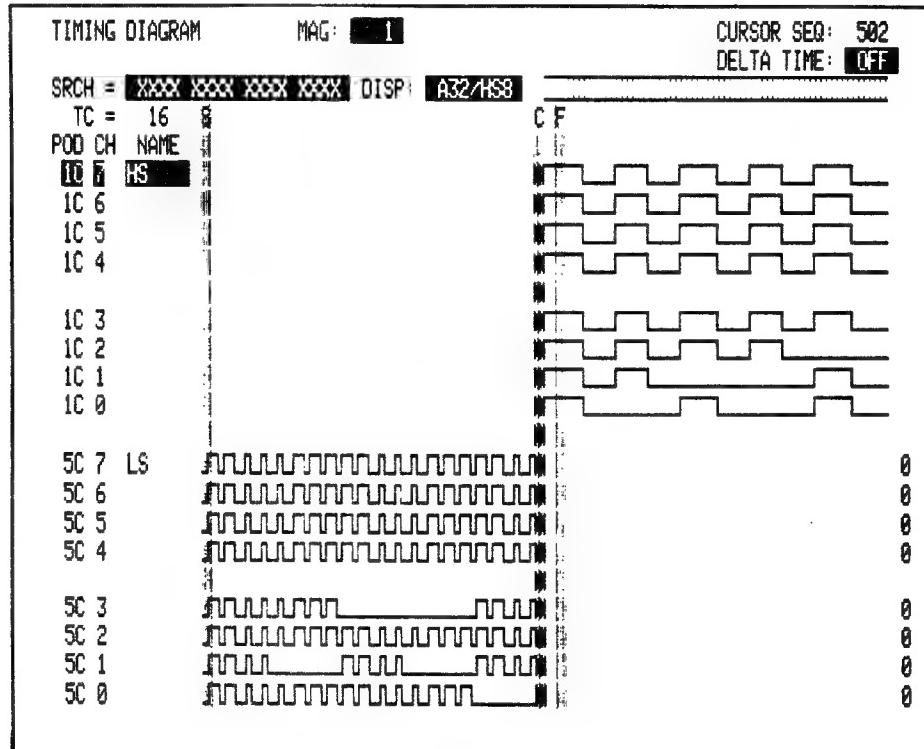


Figure 9. 91A32 ARMS 91HS8 Timing Diagram.

The default 91A32 ARMS 91HS8 Timing display is divided into left and right sides. The left side of the display shows all 512 bytes of 91A32 data, and the right side shows the first 512 bytes of 91HS8 data. There is no time-correlated display of 91A32 and 91HS8 data.

In the default display, the magnification (MAG) field is set to 1, showing the entire 91A32 memory and the first one-eighth of the 91HS8 memory. The memory window field will indicate that all of memory is being displayed, but actually only the shared 91A32/91HS8 data window is being displayed.

An arrow in the fourth display line indicates that more data 91HS8 can be viewed by moving the cursor to the right.

Two different trigger locations will be displayed. A trigger mark labeled "S" (slow) will be displayed in the 91A32 data. A trigger mark labeled "F" (fast) will be displayed somewhere in the 91HS8 data, though it may not be visible in the combined 91A32 ARMS 91HS8 display.

As with 91HS8 ONLY data described earlier in this section, search operations are only valid for the block of data currently being displayed. Moving the cursor to the right margin will cause a new 512-word block of 91HS8 data to be displayed.

# GPIB PROGRAMMING

The 91HS8 module adds parameters to the ACQMEM and BOARDS? commands of the DAS GPIB language. Other commands listed in Section 12 of the *DAS 9100 Series Operator's Manual* are not affected.

Note: The 91HS8 does not use the HSAC (high speed acquisition) command. If you attempt to use the HSAC command, the 91HS8 will return an error message.

## ACQMEM Command

The ACQMEM command can be used to retrieve 91HS8 memory data. The command format is:

ACQMEM <slot> [ ,GLITCH]

The <slot> argument is a decimal number identifying the bus slot number where the 91HS8 Interface card is installed.

The GLITCH argument is optional. If used, this argument tells the DAS to send the glitch data stored in the specified memory card, rather than the sampled data. If glitch detection was turned off during the last acquisition cycle, but "ACQMEM X, Glitch" was sent, the DAS will send back the string "ACQMEM %".

Other aspects of the ACQMEM command and response are explained in Section 12 of the *DAS 9100 Series Operator's Manual*.

## BOARDS? Command

In the BOARDS? command, the 91HS8 has a board value of 84 (hex).



## ERROR AND PROMPTER MESSAGES

DESKEW COMPLETE	The calibration procedure for all the 91HS8 probe channels has been completed successfully.
91HS8 DESKEW INCOMPLETE	At least one of the 91HS8 probe channels has not been successfully calibrated.
INCREASE CLOCK INTERVAL TO $\geq 5$ nS	This message appears if an attempt is made to turn GLITCHES ON while the clock interval is less than 5 ns.
DISABLE GLITCHES BEFORE DECREASING CLOCK INTERVAL	This message appears if an attempt is made to decrease the clock interval to a value less than 5 ns while the GLITCHES option is turned ON.
REMOVE GLITCH FROM TRIGGER SEQUENCE	This message appears if an attempt is made to turn GLITCHES OFF while a glitch event is programmed in the Trigger sequence.
DELAY VALUE ENTERED WAS ADJUSTED	The delay value just entered was automatically decremented to the next valid entry. This can occur when the DELAY field is exited.
TIMEOUT VALUE ENTERED WAS ADJUSTED	The timeout value just entered was automatically decremented to the next valid entry. This can occur when a timeout event field is exited.
TRIGGER WORD CALCULATED	There are two cases where the trigger word cannot be identified: <ol style="list-style-type: none"> <li>1. Data was sampled at a point where it was changing (unstable), so that the trigger circuits recognized a trigger word, but the same word was not stored in memory.</li> <li>2. Trigger on A, followed by T, reset on B. When A is out of memory.</li> </ol>
CHANGE FALSE TRIGGERING BEFORE SETTING FILTER	This message appears if you try to turn the filter on while the TRUE/FALSE field is set to FALSE or $\neg$ FALSE.
ENTER A VALUE BETWEEN 80 and 32760	This message appears when you try to exit a Delay Counter field after having entered an illegal value. Enter a new value within the range specified.
ENTER A VALUE BETWEEN 4 (or 8 or 16) and 32760	This message appears when you try to exit a Timeout Event field after having entered an illegal value. Enter a new value within the range specified.



## **WARNING**

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO. REFER TO OPERATORS SAFETY SUMMARY AND SERVICE SAFETY SUMMARY PRIOR TO PERFORMING ANY SERVICE.



## INSTALLATION AND SERVICE INFORMATION

### INSTALLING 91HS8 AND 91HSE8 MODULES

**WARNING**

*The following information is for qualified service personnel only. Some of the procedures require you to remove protective coverings. Always turn off the DAS and disconnect the power cords from both the DAS and the 91HS8 module cabinets before removing any covers.*

#### INSTALLATION PROCEDURE ORGANIZATION

This appendix contains five types of information:

- how to change the 91HS8 cabinet's operating voltage range
- how to change the 91HS8 cabinet's fuse
- how to update the DAS 9100 firmware to version 1.13 or higher
- how to configure a DAS 9100 with a single 91HS8
- how to configure a DAS 9100 with multiple 91HS8s

Throughout the following procedures, it is assumed that you already know how to remove the DAS mainframe top panel and module compartment cover, and know how to install circuit boards into the mainframe bus slots. If you are not familiar with these procedures, refer to *Section 2, Operating Instructions*, in the *DAS 9100 Series Operator's Manual*.

Do not remove or install a 91HS8/91HSE8 module until you have read the following warnings, cautions, adjustment procedures, and configuration requirements.

**WARNING**

*When installing or removing instrument modules, open only those compartments specified in the procedure. Other compartments in both the DAS mainframe and the 91HS8 cabinet may contain hazardous voltages.*

*After installing or removing modules, be sure to replace the mainframe covers. Circuit boards and components can become very hot during operation. Covers ensure proper airflow for circuit cooling and protect the technician from electrical hazards and burns.*

**CAUTION**

*When instrument modules are being installed, the mainframe and cabinet should be turned off and unplugged from their power source. Damage to the module's circuitry may occur if the module is installed while the mainframe is receiving power.*

**DO NOT PRESS ON MODULE COMPONENTS.** Use care when handling the 91HS8 and 91HSE8 interface boards or the circuitry may be damaged.

## CHANGING THE 91HS8 CABINET'S VOLTAGE RANGE

The 91HS8 cabinet's voltage range setting is indicated on the back panel of the 91HS8 cabinet. A phillips-type screw will be in either of two positions to indicate the current voltage setting. Refer to Figure B-1.

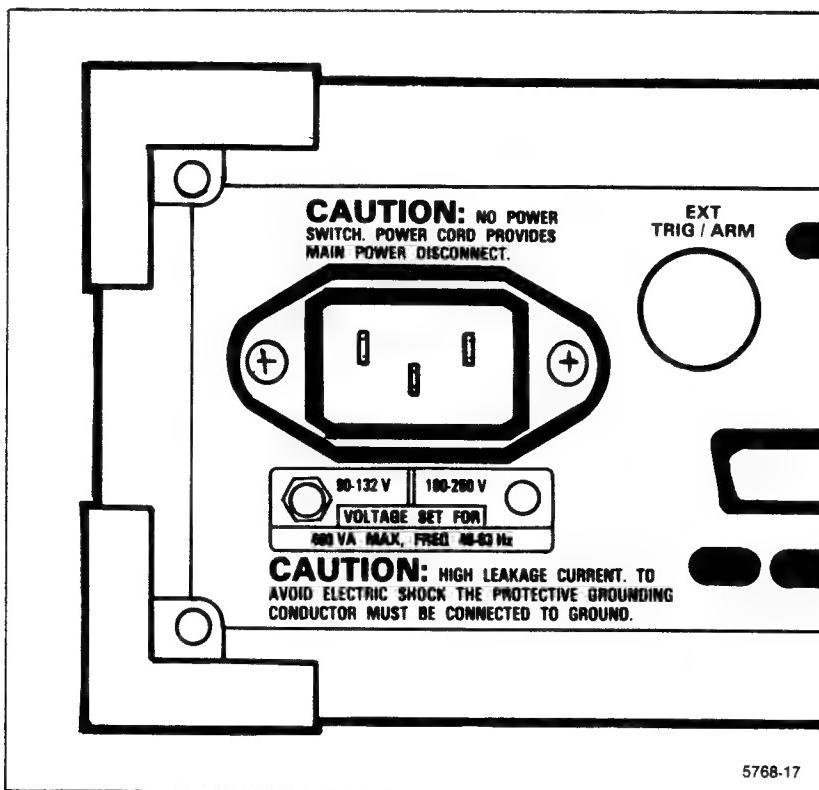


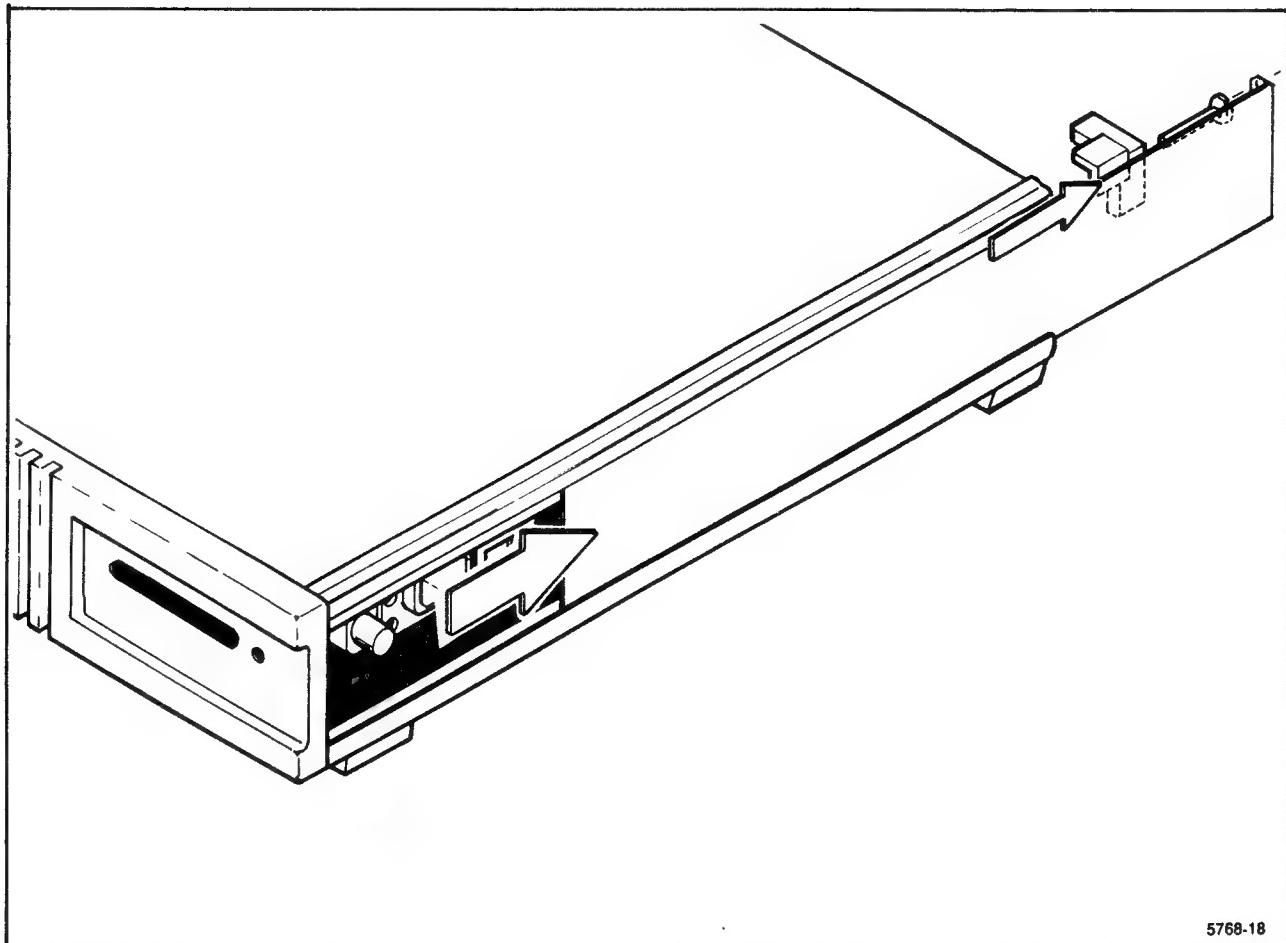
Figure B-1. 91HS8 cabinet voltage indicator screw.

The voltage indicator screw does not select the operating voltage; that selection can only be made by changing a switch position on the power supply inside the 91HS8 cabinet. If you need to change the voltage range selection, use the following procedure.

Follow all safety precautions listed earlier in this section. Make sure both the DAS and the 91HS8 cabinet have been disconnected from their power sources.

### Accessing the 91HS8 cabinet voltage switch and fuse.

The 91HS8 cabinet power supply is located toward the front of the cabinet. To access the voltage range selector switch and/or fuse, refer to Figure B-2, and use the following procedure:

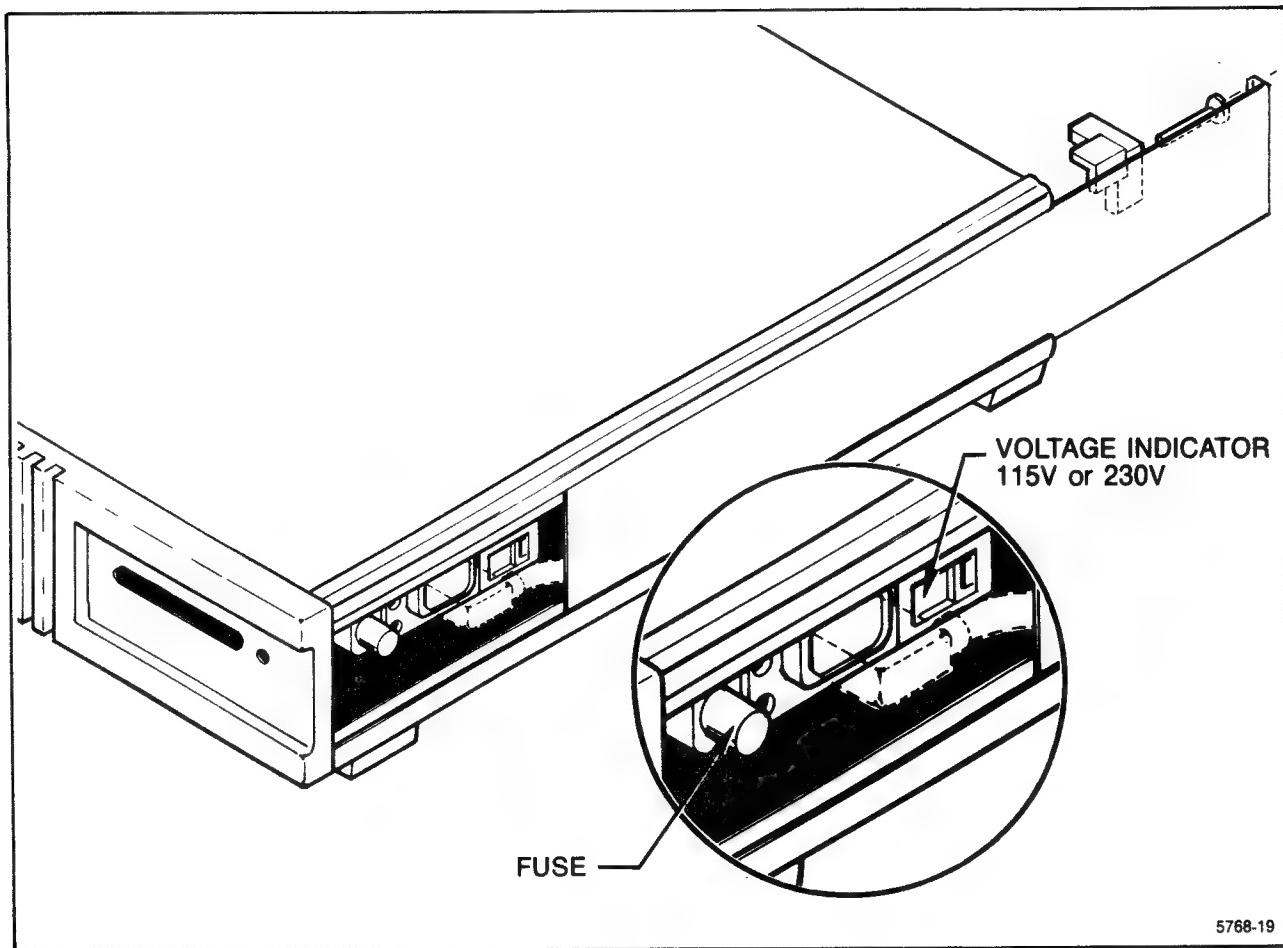


**Figure B-2. Exposing the 91HS8 power supply.**

1. The 91HS8 cabinet covers are similar to the DAS 9100 mainframe's covers. Loosen the two right-hand corner pieces and rotate them out of the path of the side panel.
2. Using a firm grip, pull the side panel approximately eight inches toward the rear. You do not have to remove the side panel entirely.

**Selecting a different voltage range.**

3. Figure B-3 illustrates the location of the fuse and voltage selector switch. Use an insulated screwdriver to select either 115V or 230V. The selected voltage will appear on the switch's legend.
4. Reverse steps 1 and 2 to replace the 91HS8 cabinet's covers.
5. Move the back panel voltage indicator screw to the correct position.



**Figure B-3. Selecting a different voltage range.**

**REPLACING THE 91HS8 CABINET'S FUSE**

The 91HS8 cabinet's fuse is located next to the voltage selection switch inside the 91HS8 cabinet. Use steps 1, 2, and 3 of the preceding procedure to expose the fuse. Be sure to follow all safety precautions outlined for that procedure.

Use only a fuse of the correct type and rating. The 91HS8 cabinet fuse should be a fast-blow type rated at 5 amps/120V or 2.5 amps/230V. Contact your Tektronix representative if you have questions concerning the proper fuse.

## UPGRADING THE DAS FIRMWARE VERSION

91HS8 and 91HSE8 modules operate only in DAS mainframes containing firmware version 1.13 or higher. To check the firmware version installed in your DAS 9100, power up the DAS. The firmware version of the mainframe can be found in the upper right corner of the DAS power-up menu. If your DAS does not contain firmware version 1.13 or higher, you must use a firmware update kit and the following procedure to replace the firmware EPROM on the DAS controller board.

Some 91HS8/91HSE8s are shipped with a firmware update kit included with the accessories. Contact your Tektronix representative if you need a firmware update kit.

### *NOTE*

*All 91HS8/91HSE8 modules installed in the DAS must have the same module firmware release version. To determine which 91HS8 firmware version is installed, check the Power-up menu. If different version numbers appear next to the 91HS8 module names, you need to contact your Tektronix representative for a 91HS8 Firmware update kit.*

*If you own 91A04A or 91AE04A Data Acquisition modules, you must update their firmware to version 2.0 in order to be compatible with DAS 9100 firmware version 1.13 (or higher). To determine which firmware version is installed, check the Power-up menu. If a "V2" appears after the board type identification, version V2 software is installed. If "V2" is not displayed, version V1 software is installed. Contact your Tektronix Sales Representative if you need a 91A04A firmware update kit.*



*Damage may occur to the Controller board if it is removed or installed while the mainframe is receiving power. To avoid damage, unplug the instrument from its power source.*



*The Controller board may be susceptible to damage from static discharge. Observe the static discharge CAUTIONS listed in the Operator's Safety Summary located at the front of this addendum.*

1. Remove the top panel and module compartment cover from the DAS mainframe.
2. Use the circuit board ejector tool to remove the Controller board from bus slot 0. Then, lay the board on a conductive material.
3. Wear a grounded wrist strap to drain static electricity.
4. Remove the patch ROM U597 located in the lower-right corner of the Controller board. Refer to Figure B-4. Be sure to notice the position of pin 1.

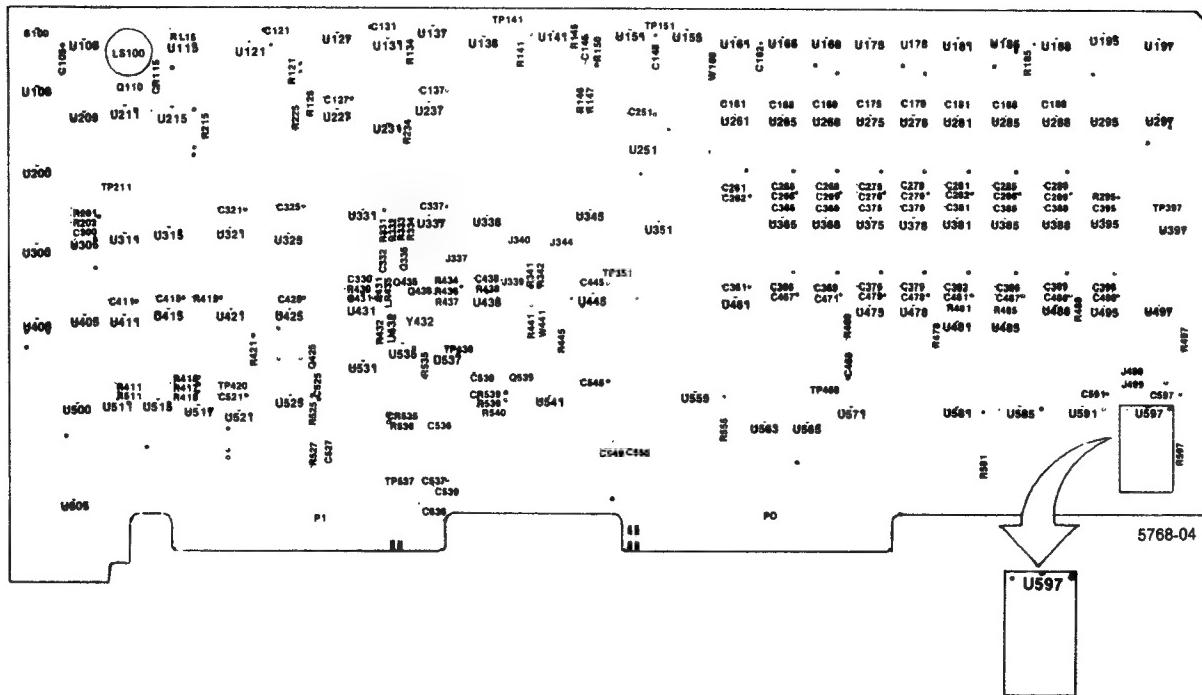


Figure B-4. ROM U597 location on the DAS Controller board.

5. Insert the Firmware patch ROM in the U597 location. Be sure pin 1 is properly positioned and that no pins are folded under the IC.
6. Re-install the Controller board into the mainframe's bus slot 0. Replace the module compartment cover and top panel of the mainframe.

To verify the operation of the new firmware ROM, power up the mainframe. The power-up display should read FIRMWARE VERSION 1.13 (or higher) in the upper-right corner of the screen.

An error in the ROM is indicated by a ROM CHECKSUM ERROR 0,0. If this error occurs, re-check the installation of the ROM, then power up the mainframe. If the error continues, contact your nearest Tektronix Service Center.

## CONFIGURATION REQUIREMENTS

91HS8 and 91HSE8 modules can reside in a DAS 9100 mainframe containing the following module types:

- 91A32 Data Acquisition Modules
- 91P16/32 Pattern Generator Modules
- 91S16/32 Pattern Generator Modules
- Option 6, I/O Communication Interface

You must remove all other module types from the DAS when you install 91HS8/HSE8 modules.

### WARNING

*When installing or removing instrument modules, open only those compartments specified in the procedure. Other compartments in both the DAS mainframe and the 91HS8 cabinet may contain hazardous voltages.*

*After installing or removing modules, be sure to replace the mainframe covers. Circuit boards and components can become very hot during operation. Covers ensure proper airflow for circuit cooling and protect the technician from electrical hazards and burns.*



*When instrument modules are being installed, the 9100 mainframe and 91HS8/91HSE8 cabinets should be turned off and unplugged from the power source. Damage to the module's circuitry may occur if the module is installed while the mainframe and/or cabinet is receiving power.*

**DO NOT PRESS ON MODULE COMPONENTS.** Use care when handling the 91HS8 and 91HSE8 interface boards or the circuitry may be damaged.

The 91HS8 interface card installed in the DAS mainframe instrument module compartment can reside in any instrument slot powered by a +5 V power supply. Note: The 91HS8 Master Interface board cannot be installed in DAS slot 6 because of a heat sink attached to the back of the circuit board; 91HSE8 Standard Interface boards do not have this restriction.

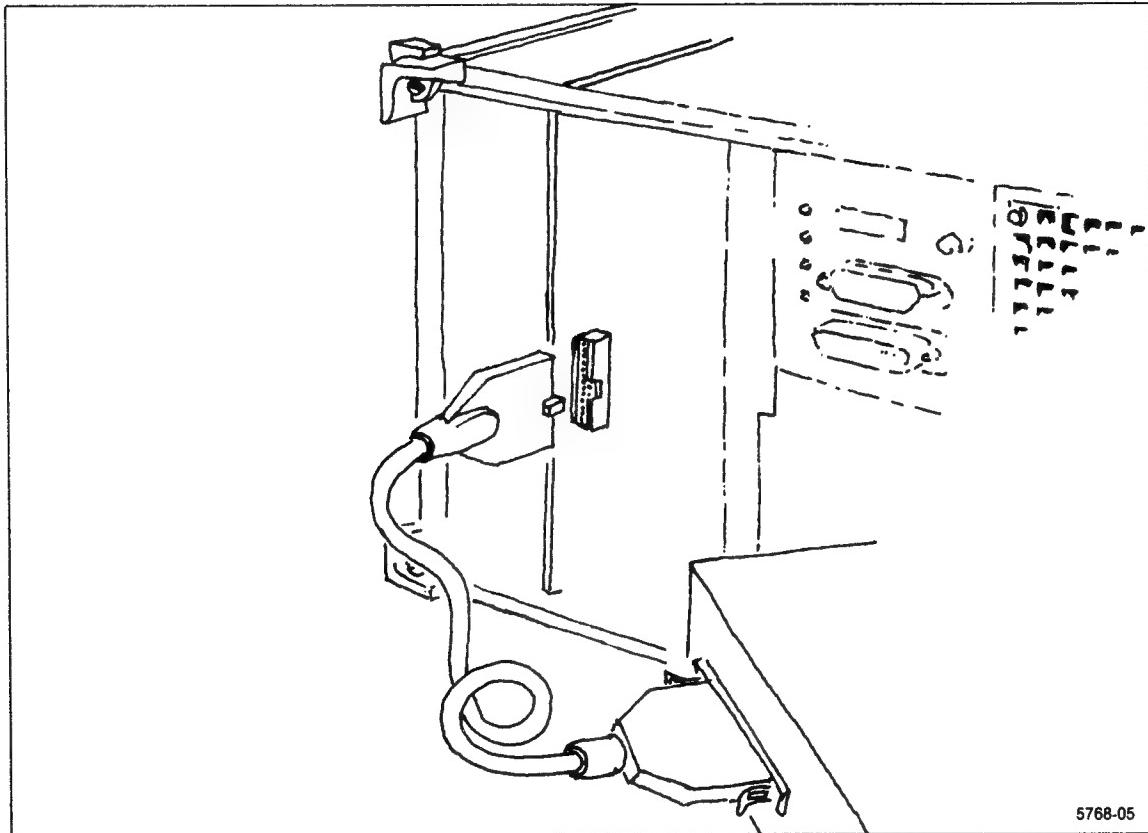
Some DAS mainframes are equipped to power only a portion of the instrument module slots. You can determine which module slots are receiving +5 V power by looking at the holes in the power supply cover (located behind the CRT in the DAS mainframe); if chrome pins are visible in all three holes, then all DAS module slots are provided with +5 V power. Refer to the decals on the power supply cover to determine which power supply affects which module slots. DO NOT remove the power supply area cover.

While the 91HS8 and 91HSE8 cabinets are identical, there are two versions of the interface board. The Standard Interface board, supplied with 91HSE8 modules, occupies only one DAS instrument slot. The Master Interface board, supplied with 91HS8 modules, has a large heat sink attached to the back of the circuit board that causes it to take up space for two circuit boards in the DAS instrument module compartment.

The 91HS8 (with Master Interface board) is required to synchronize timing signals any time two or more 91HS8/91HSE8 modules are installed in the DAS. If only eight channels of high-speed acquisition are required, you can use either a 91HS8 or a 91HSE8 module. Refer to the *Operating Instructions* section of this addendum.

### Configuring the DAS for a Single 91HS8/91HSE8 Module

1. Position the back of the 91HS8 cabinet next to the back of the DAS 9100 mainframe.
2. Remove the top panel and instrument module cover from the DAS. You do not need to remove any covers from the 91HS8 cabinet.
3. Remove any module types not listed under *Configuration Requirements* earlier in this section.
4. Install the 91HS8 Interface board into any DAS module slot supplied with +5 V power. Press the Interface board all the way down into its card-edge connector.
5. Connect the small (female harmonica connector) end of the interconnect cable into the Pod connector on the back of the Interface card. The connector has a notch on one side that prevents incorrect insertion. See Figure B-5.



**Figure B-5. Interconnect cable between 9100 mainframe and 91HS8 cabinet.**

6. Connect the large end of the interconnect cable to the connector on the back of the 91HS8 cabinet. The connector can only fit one way.
7. Re-install the DAS instrument module compartment cover. Re-install the DAS top cabinet panel.
8. Plug the power cord into the back of the 91HS8 module.
9. The 91HS8 probes have colored marker clips attached near the probe tip to aid in channel identification. The probes use the following color scheme:

Ext/Arm--white  
Probe 0--black  
Probe 1--brown  
Probe 2--red  
Probe 3--orange  
Probe 4--yellow  
Probe 5--green  
Probe 6--blue  
Probe 7--violet

You may wish to use a marking pen to label the probe tips or colored clips as to channel number.

10. Position the 91HS8 cabinet next to, or on top of, the DAS mainframe. To minimize strain on cables and connectors, move the assembly as little as possible.

## Configuring the DAS for Multiple 91HS8 Modules

Multiple 91HS8 configurations require that you install one 91HS8 and one or more 91HSE8 modules. The 91HS8 cabinet is identical for both versions, but the 91HS8 module is supplied with the Master Interface card, while the 91HSE8 module is supplied with the Standard Interface card. Any time you install more than one 91HS8 cabinet, you must install one Master Interface card.

All 91HS8/91HSE8 modules must be equipped with the same module firmware version. You can check the module firmware version by displaying the Power-up menu after installing the modules. If you have different firmware versions installed, contact your Tektronix representative for an update kit.

1. Remove the top panel and instrument module cover from the DAS. Remove any module type not listed under *Configuration Requirements*.
2. Position the back of the first 91HS8 module next to the back of the DAS. Because the clock cables needed to align multiple 91HS8s are short, you need to decide now how you are going to stack your 91HS8 modules. This decision will also affect where in the DAS mainframe you choose to install the Master Interface card.

For example, if you are using four 91HS8 modules, you may wish to stack two 91HS8 cabinets on each side of the DAS mainframe. In this case, you will want to install the Master Interface card in a low-numbered DAS module slot (near the center of the instrument) so that the clock cables for the 91HS8 modules placed on the left will reach.

If you are only using two 91HS8 modules, you may wish to place the 91HS8 cabinets to the right of the DAS mainframe, and then install the Master Interface card in a high-numbered DAS module slot.

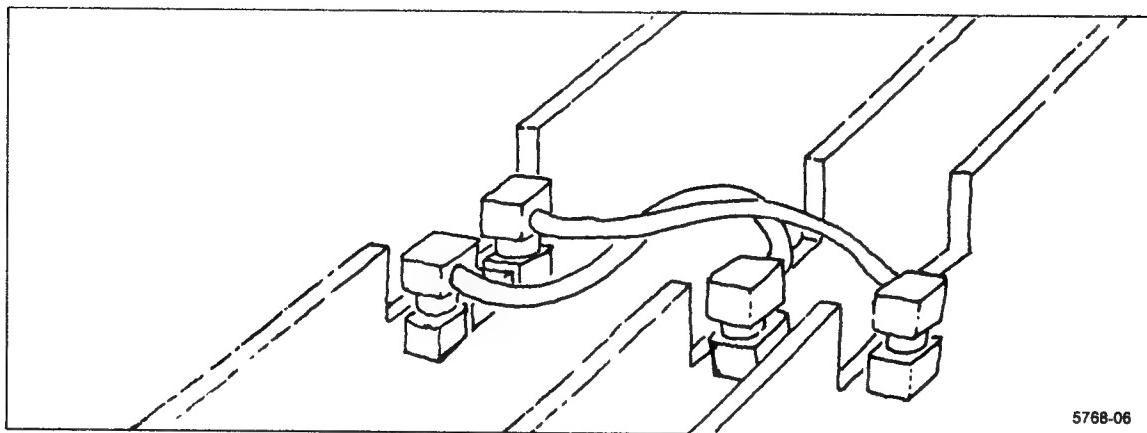
3. Install the Master Interface card into the DAS. Use any module slot except slot 6; the heat sink on the back of the Master Interface card requires that you leave one empty module slot to the right.

The Master Interface card can be installed in any DAS module slot receiving +5 V power. Make sure you leave enough room in adjacent slots for the 91HS8 Standard Interface cards.

4. Install all Standard Interface cards into the DAS. Standard Interface cards must be in module slots next to the Master Interface card. Standard Interface cards can be placed on either or both sides of the Master Interface card (allow one extra empty slot for the Master Interface card's heat sink).

Each Standard Interface card must be installed in a DAS module slot receiving +5 V power, and the card must be close enough to the Master Interface card for the short trigger cable to reach.

5. Gently press down on each circuit board to make sure it is seated.
6. Each 91HSE8 module is shipped with a short trigger cable (p/n 175-6425-00). Install this cable from the SMB connector on the top of a Standard Interface card to one of the connectors on the top of the Master Interface card. Repeat for each 91HSE8 module. Trigger cables can be connected to any one of the three jacks on the top of the Master Interface board. Refer to Figure B-6.



**Figure B-6. Trigger cable connections between Master and Standard Interface cards.**

#### Removing the 91HS8 Mainframe Cover

When using multiple 91HS8s, you need to open the 91HS8 cabinet to install two clock cables and position a jumper. The clock cables are contained in the 198-554X-00 kit shipped with each module. Each 91HS8/91HSE8 is shipped with one of three possible clock cable kits; the cable part number for each module is listed on a label on the 91HS8 power supply cover. Make sure you are using the correct kit for each 91HS8. Refer to the *Standard and Optional Accessories* list in the *General Information* section of this manual.

The 91HS8 module cabinet cover is attached in the same way as the 9100 mainframe cover. To remove the cover, use the following procedure.

**WARNING**

*When installing or removing instrument modules, open only those compartments specified in the procedure. Other compartments in both the DAS mainframe and the 91HS8 cabinet may contain hazardous voltages.*

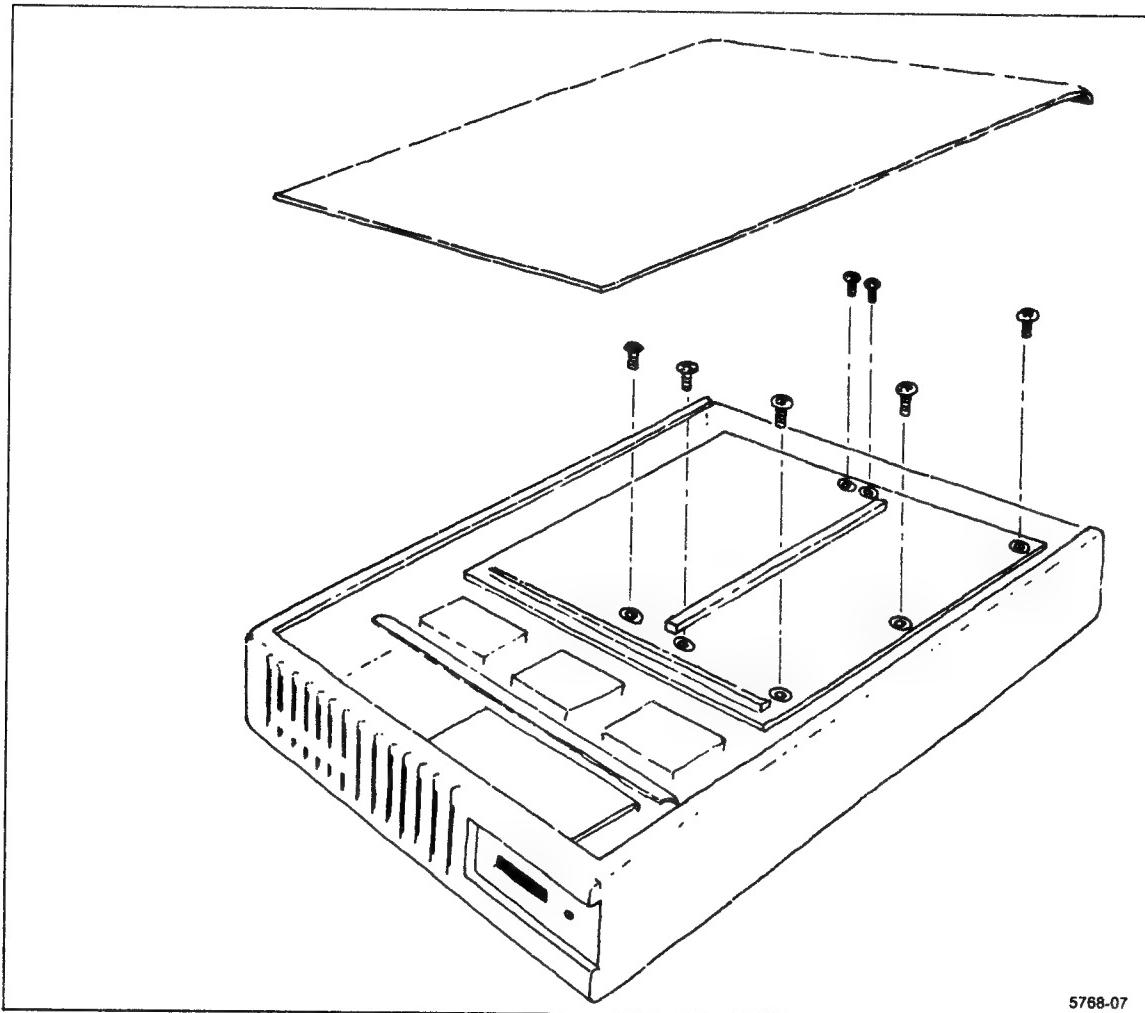
*After installing or removing modules, be sure to replace the mainframe covers. Circuit boards and components can become very hot during operation. Covers ensure proper airflow for circuit cooling and protect the technician from electrical hazards and burns.*

**CAUTION**

*When instrument modules are being installed, the mainframe and cabinet should be turned off and unplugged from their power source. Damage to the module's circuitry may occur if the module is installed while the mainframe is receiving power.*

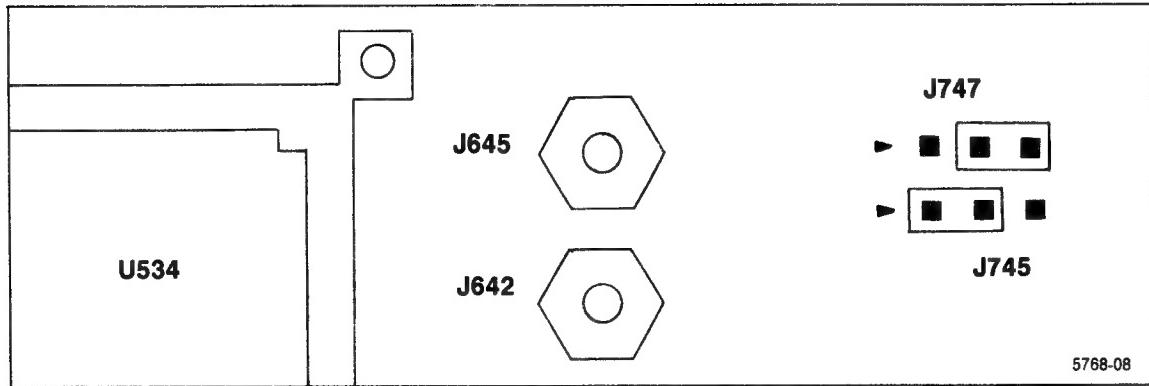
***DO NOT PRESS ON MODULE COMPONENTS. Use care when handling the 91HS8 and 91HSE8 circuit boards or the circuitry may be damaged.***

1. Loosen the screws located in the upper-right and upper-left corners of the 91HS8 cabinet's back panel. Then rotate the plastic brackets behind these screws until they no longer block the back edge of the top panel.
2. Grasp the back edge of the top panel and pull it back until the front edge disengages from the cabinet. Note: Pull firmly, but be careful not to pull the instrument off the workbench.
3. Lift the panel up and off.
4. Remove the seven screws securing the top circuit board. Refer to Figure B-7.



**Figure B-7. Removing the screws securing the top circuit board.**

5. The top circuit board is hinged along one edge. Grasp the aluminum stiffening bar and gently lift the top circuit board. The board will stay upright at 90 degrees. Do not attempt to force the board beyond 90 degrees.
6. For multiple 91HS8s, you must position jumper 745 in each 91HS8 cabinet as shown in Figure B-8.

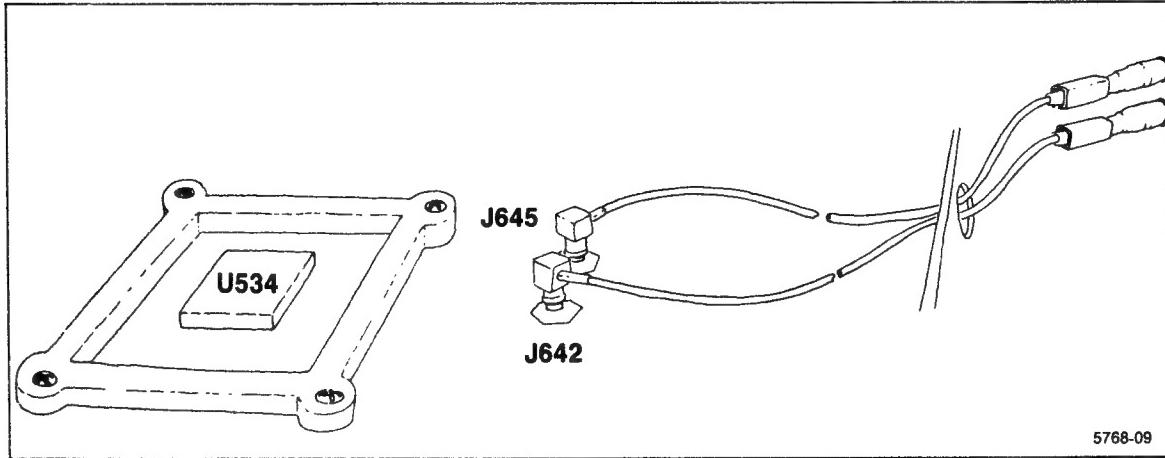


**Figure B-8. Multiple 91HS8 position for jumper 745.**

7. Compare the cable part number on the clock cable bag with the number listed on the protective power supply shield inside the 91HS8 cabinet. Different part numbers denote different cable lengths. If you install the wrong length of clock cable, skew between 91HS8 modules will be affected.

Clip a red marker onto each end of one of the cables. These markers will help you identify the polarity of each cable after the 91HS8 cabinet has been closed.

8. Take the cable with the red marker and connect one end to J645 (+) on the 91HS8 Acquisition board. See Figure B-9.



**Figure B-9. Connecting clock cables to the 91HS8 Acquisition board.**

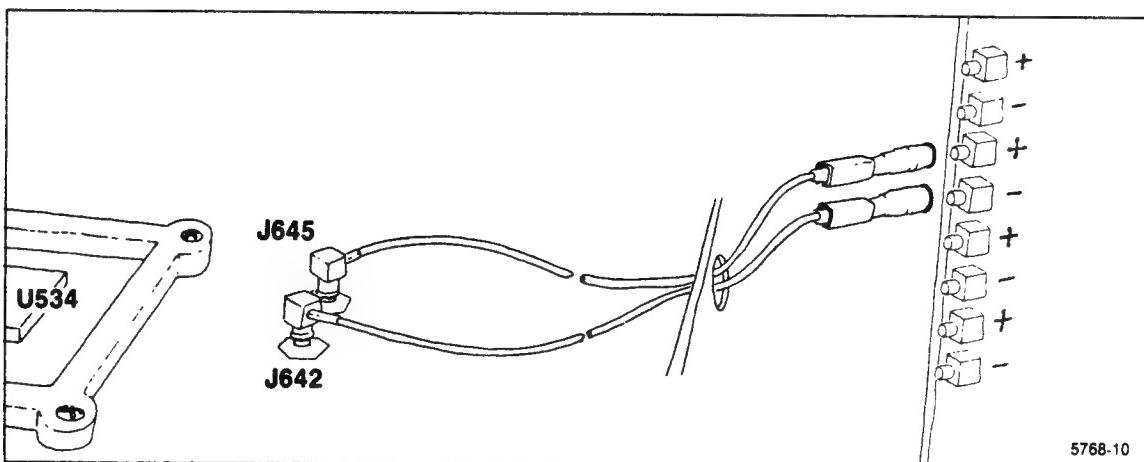
9. Connect one end of the other clock cable to J642 (-).
10. Thread the free ends of both clock cables through the plastic grommet provided in the clock cable kit. Insert the grommet in the Clock Cable hole in the back of the 91HS8 cabinet. The hole in the back panel is labeled on the outside.
11. Gently lower the memory board back into place and secure with the seven screws you removed in Step 4. Replace the top panel of the 91HS8 module.
12. Repeat steps 1 through 11 for each of the remaining 91HS8 modules.

### Connecting 91HS8 Modules to the Interface Cards

- Both clock cables from each 91HS8 cabinet attach to the Master Interface card. The rear of the Master Interface card has a row of high-speed clock connectors numbered from the top down: J100, J105, J200, J205, J300, J305, J400, and J405.

Any pair of clock cables can be connected to any pair of Master Interface connectors, so long as you do not mix the cable pairs. Starting with J100 and J105, connect the cable with the red marker to J100 (+), and connect the unmarked cable to J105 (-).

Each additional 91HS8 cable pair must be installed with the red cable attached to the JX00 (+) connector, and the unmarked cable to the JX05 (-) connector. Refer to Figure B-10.



**Figure B-10. Multiple 91HS8 clock cable to Master Interface connections.**

- Each 91HS8 cabinet is connected to an interface card by a long interconnect cable. The interface card's slot location in the DAS determines the pod I.D. assigned to each 91HS8 cabinet.

For each interface card, connect the small (female harmonica connector) end of the interconnect cable into the Pod connector on the back of the interface card. The connector has a notch on one side that prevents incorrect insertion. See Figure B-5.

- Connect the large end of the interconnect cable to the connector on the back of a 91HS8 cabinet. The connector can only fit one way.
- After you have connected all of the 91HS8 cabinets to their respective interface cards, re-install the DAS instrument module compartment cover. Then re-install the DAS top cabinet panel.
- Plug a power cord into the back of each 91HS8 cabinet.
- Place the 91HS8 probes in a convenient location. The probes have a colored marker clip attached near the tip to aid in channel identification. You may wish to use a marking pen or a second set of colored clips to differentiate between probes from different 91HS8 cabinets. The probes use the following color scheme:

Ext/Arm--white	Probe 4--yellow
Probe 0--black	Probe 5--green
Probe 1--brown	Probe 6--blue
Probe 2--red	Probe 7--violet
Probe 3--orange	

- Position the 91HS8 cabinets next to, or on top of, the DAS mainframe. To minimize strain on cables and connectors, move the assembly as little as possible.



## **MANUAL CHANGE INFORMATION**

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

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